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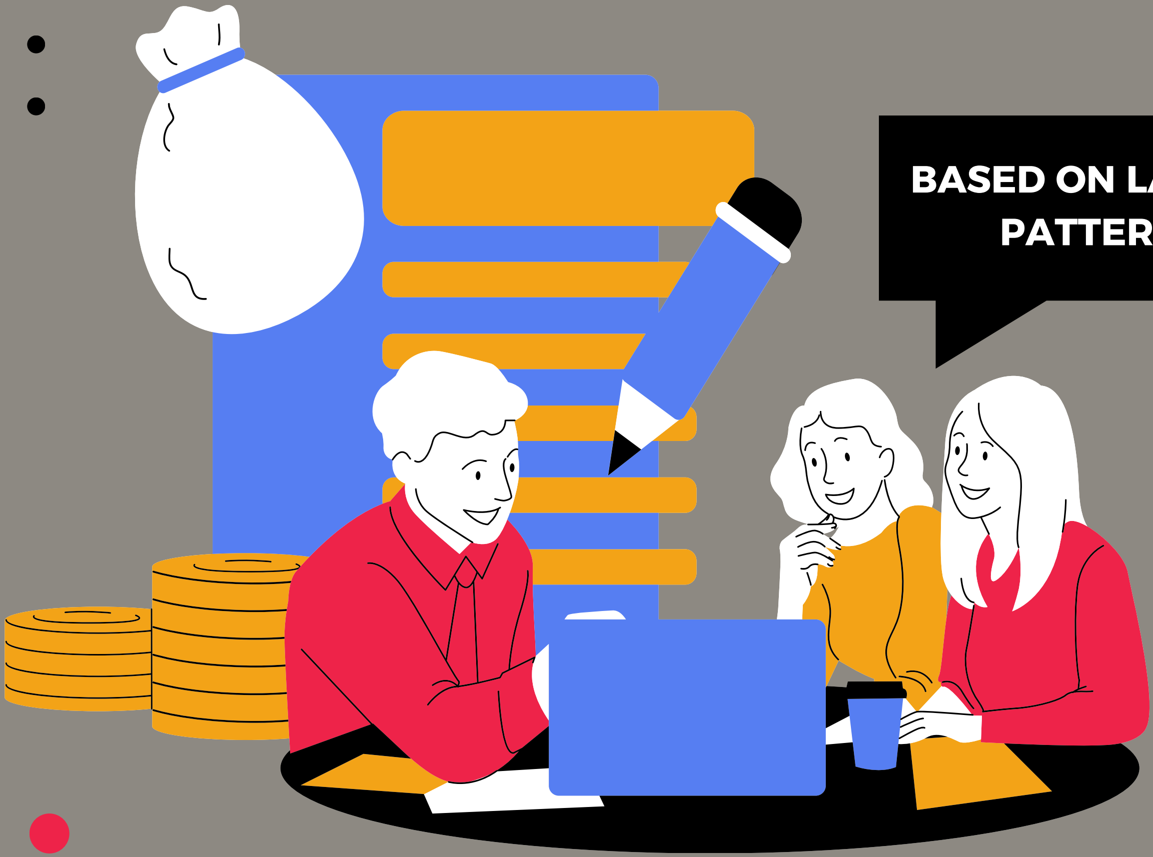
CUET 2024

PHYSICS

Sample Paper 1



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CUET PRACTICE PAPER-1

PHYSICS

1. In charging by induction,
a) body to be charged must be an insulator
b) body to be charged must be a semiconductor
c) body to be charged must be a conductor
d) any type of body can be charged by induction

2. The Coulomb’s law is based on the assumption that charges are treated as
a) positive charges
b) negative charges
c) neutral charges
d) point charges

3. The ratio of electric fields on the axis and at equator of an electric dipole will be
a) 1: 1 b) 2: 1 c) 4: 1 d) None of these

4. The electric potential at point A is 20 V and at B is -40 V. Find the work done by an electrostatic force in moving an electron slowly from B to A.
a) 9.6 × 10^{-19} J b) - 9.6 × 10^{-19} J c) 4.8 × 10^{-19} J d) - 4.8 × 10^{-19} J

5. A hollow metallic sphere of radius R is given a charge Q. Then, the potential at the centre
a) Zero b) $\frac{1}{4\pi\varepsilon_0}.\frac{Q}{R}$ c) $\frac{1}{4\pi\varepsilon_0}.\frac{2Q}{R}$ d) $\frac{1}{4\pi\varepsilon_0}.\frac{Q}{2R}$

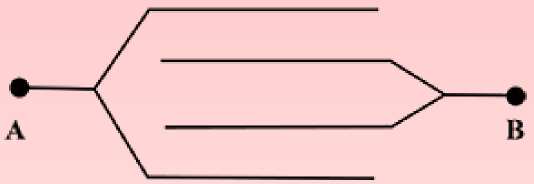
6. An electric field of 10 N/C exists along the x-axis in space. Calculate the potential difference $V_Q - V_P$ where the points P and Q are given by P= (0,0); Q= (4m,2m).
a) 20V b) 30V c) 40 V d) 50V

7. A conducting sphere of radius 10 cm is charged to 10 μC. Another uncharged sphere of radius 20 cm is allowed to touch it for some time. After that if the spheres are separated, then surface density of charges, on the spheres will be in the ratio of
a) 1:4 b) 1:3 c) 2:1 d) 1:1

8. A parallel plate capacitor with air between the plates has a capacitance of 9pF. The separation between its plates is ‘d’. The space between the plates is now filled with two dielectrics. One of the dielectrics has dielectric constant $K_1=3$ and thickness d/3 while the other one has electric constant $K_2=6$ and thickness 2d/3. Capacitance of the capacitor now is

a) 45 pF b) 40.5 pF c) 20.25 pF d) 1.8 pF

9. Four metallic plates each with a surface area of one side A are placed at a distance d from each other. The plates are connected as shown in the circuit diagram. Then the capacitance of the system between a and b is



a) $\frac{3\epsilon_0 A}{d}$ b) $\frac{2\epsilon_0 A}{d}$ c) $\frac{2\epsilon_0 A}{3d}$ d) $\frac{3\epsilon_0 A}{2d}$

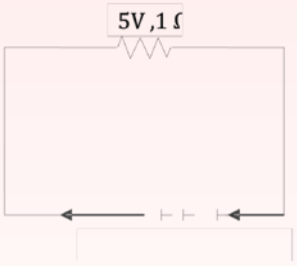
10. A soap bubble is charged to a potential of 16V. Its radius is, then doubled. The potential of the bubble now will be

a)16V b)4V c)8V d)2V

11. A wire has an area of cross section 0.1 m^2 having 62.5×10^{18} electrons flowing per second through it. Find the value of current.

a) 0.1 A b) 1 A c) 10 A d) 0.11 A

12. In the given electric circuit, each cell has an electromotive force (emf) of 5V and an internal resistance of 1Ω. The external resistance in the circuit is 3Ω. Determine the value of the current (I) flowing through the circuit, expressed in amperes.



a) 1 A b) 1.5 A c) 2 A d) 2.5 A

13. The resistance of 2 A ammeter is 0.1Ω. To convert it into 10 A ammeter, the shunt resistance required will be

a)0.18 Ω b) 0.00125 Ω c) 0.002 Ω d) 0.125 Ω

14. Consider a straight conductor with a uniform cross-section that carries a current (I). Let's denote the specific charge on an electron as (S). The momentum per unit length of the conductor, contributed by the drift velocity of the free electrons only, can be calculated as follows.

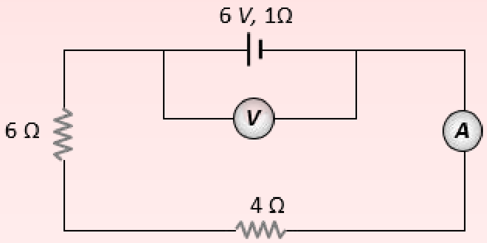
a) IS b) I/S c)$\sqrt{(\frac{I}{s})}$ d) $(I/S)^2$

15. To electroplate a piece of metal weighing 400 g with 5% of its weight in gold, we need to determine how long it will take to deposit the required amount of gold using a current strength of 5 A.

(Given, electrochemical equivalent of H $= 0.0104 \times 10^{-4}\ \mathrm{gC}^{-1}$, atomic weight of gold = 197.1, atomic weight of hydrogen = 1.008)

a)7347.9 s b) 14695.8 s c) 7151.7 s d) 14000 s

16. In the circuit shown here, the readings of the ammeter and voltmeter are



a) 6 A, 60 V
b) 0.6 A, 6 V
c) 6/11 A, 60/11 V
d) 11/6 A, 11/60 V

17. To determine the minimum magnitude of the magnetic field, we consider a scenario where a particle with a charge of 2×10^{-12} C moves along the x-axis with a velocity of 10^5 m/s. The particle experiences a force of 10^{-9} N in the y-direction due to the magnetic field. Calculate the minimum value of the magnetic field.

a) 5×10^{-3} T in z – direction
b) 2×10^{-3} T in z – direction
c) 4×10^{-3} T in z – direction
d) 9×10^{-3} T in z – direction

18. When a proton with an energy of 1 MeV moves in a plane perpendicular to a uniform magnetic field of 6.28×10^(-4) T, and considering its mass as 1.7×10^(-27) kg, the cyclotron frequency of the proton is approximately equal to.

a) 10^7 Hz b) 10^5 Hz c) 10^6 Hz d) 10^4 Hz

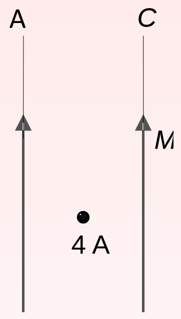
19. Given that a magnetic pole with a strength of 9×10^{-2} A-m experiences a force of 2N, determine the magnetic field at the point where the pole is located.

a) 20 Wbm^{-2} b) 50 Wbm^{-2} c) 112.5 T d) 22.2 T

20. Consider a charged particle with mass 'm' and charge 'q' entering a region of uniform magnetic field 'B' perpendicular to its velocity 'v'. Prior to entering the magnetic field region, the particle was accelerated by a potential difference 'V' (in volts). Calculate the diameter of the circular path traced by the charged particle within the magnetic field region.

a) $\frac{2}{B}\sqrt{\frac{mV}{q}}$ b) $\frac{2}{B}\sqrt{\frac{2mV}{q}}$ c) $B\sqrt{\frac{2mV}{q}}$ d) $\frac{B}{q}\sqrt{\frac{2mV}{B}}$

21. AB and CD are long parallel conductors separated by certain distance. X is the mid-point between them (see the figure). The net magnetic field at X is B. Now, the current 4 A is switched off. The field at X now becomes



a) 2B b) B c) $\frac{B}{2}$ d) 3B

22. A magnet is suspended in the magnetic meridian with an untwisted wire. The upper end of wire i through 180° to deflect the magnet by 30° from magnetic meridian. When this magnet is replace another magnet, the upper end of wire is rotated through 270° to deflect the magnet 30° from ma meridian. The ratio of magnetic moments of magnets is

a) $1 : 5$ b) $1 : 8$ c) $5 : 8$ d) $8 : 5$

23. If a magnetic substance is kept in a magnetic field then which of the following substance is throw

a) Paramagnetic b) Ferromagnetic c) Diamagnetic d) Antiferromagnetic

24. A magnet performs 10 oscillations per minute in a horizontal plane at a place where the angle of 45° and the total intensity is 0.707 CGS units. The number of oscillations per minute at a place w angle is 60° and total intensity is 0.5 CGS units will be

a) 5 b) 7 c) 9 d) 11

25. Two identical bar magnets are placed one above the other such that they are mutually perpendicu bisect each other. The time period of this combination in a horizontal magnetic field is T. The tin of each magnet in the same field is

a) $\sqrt{2}\,T$ b) $2^{\frac{1}{4}}\,T$ c) $2^{\frac{1}{4}}\,T$ d) $2^{\frac{1}{2}}\,T$

26. Ratio of magnetic intensities for an axial point and a point on broad side-on position at equal dis from the centre of magnet will be or The magnetic field at a distance d from a short bar magnet i longitudinal and transverse positions are in the ratio

a) $1 : 1$ b) $2 : 3$ c) $2 : 1$ d) $3 : 2$

27. A wire measuring 3m in length is being moved at a velocity of 2 m/s through a magnetic field with an intensity of 0.75 Wb/m^2. The motion of the wire is perpendicular to the direction of the magnetic field. The induced emf in the wire is

a) 2.5 V b) 1 V c) 0.1V d) 2.5 V

28. Given an alternating current with a peak value of 4 A and a frequency of 80 Hz, calculate its root mean square (RMS) value and the time it takes to reach the peak value starting from zero.

a) 3.536A; 4.167 ms b) 3.536 A;15 ms c) 6.07 A; 10 ms d) 2.836 4.167 ms

29. If a hot wire ammeter measures the value of an alternating current as 20 amperes in a circuit, determine the peak value of the current is

a) 10 A b) 28.28 A c) 14.14 A d) 7.07 A

30. When an alternating voltage is connected in series with a resistance R and an inductance L, and the potential drop across the resistance is 300 V and across the inductance is 150 V, determine the applied voltage.

a) 335 V b) 250 V c) 500 V d) 300 V

31. Voltage and current in an ac circuit are given by

$$V = 3\sin\left(300\pi t - \frac{\pi}{6}\right) \text{ and } I = 4\sin\left(400\,\pi t + \frac{\pi}{6}\right)$$

a) Voltage leads the current by 30°
b) Current leads the voltage by 30°
c) Current leads the voltage by 60°
d) Voltage leads the current by 60°

32. According to Maxwell’s hypothesis, a changing electric field gives rise to

a) An emf
b) Electric current
c) Magnetic field
d) Pressure radian

33. Electric fields induced by changing magnetic fields are

a) Conservation
b) Non-conservation
c) May be conservative or non-conservation depending on the conditions
d) Nothing can be said

34. The electric field of a plane electromagnetic wave varies with time of amplitude 2 Vm^{-1} propaga along z-axis. The average energy density of the magnetic field is (in Jm^{-3})

a) 13.29×10^{-12}
b) 8.86×10^{-12}
c) 17.72×10^{-12}
d) 4.43×10^{-12}

35. The sun delivers $10^4\ Wm^{-2}$ of electromagnetic flux to the earth’s surface. The total power that i incident on a roof of dimensions 10m square will be

a) 10^4W
b) 10^5 W
c) 10^6 W
d) 10^7 W

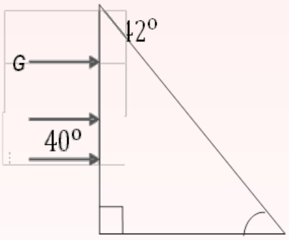
36. Infrared radiation is detected by

a) Spectrometer
b) Pyrometer
c) Nanometer
d) Photometer

37. The length of the tube of a microscope is 5 cm. The focal lengths of the objective and eye lenses are 0.2 cm and 0.5 cm. The magnifying power of the microscope is

a) 5
b) 230
c) 1250
d) 500

38. In the given figure, a mixture of blue, green, and red-coloured rays is incident normally on a right-angled prism. The critical angles for the material of the prism are 40° for red, 41° for green, and 42° for blue. In this arrangement,



a) Red colour from blue and green
b) Blue colour from red and green
c) Green colour from red and blue
d) All the three colours

39. What is the wavelength of electromagnetic waves transmitted from a source that emits waves at a frequency of 7.6×10^6 Hz?

a) 39.5 m
b) 40.5 m
c) 42.3 m
d) 50.9 m

40. What is the phase difference between the wavelets from the opposite edges of a single slit at normal incidence, when observing the Fraunhofer diffraction pattern at the angular position of the first diffraction minimum?

a) $\frac{\pi}{4}$
b) $\frac{\pi}{2}$
c) π
d) 2π

41. If the linear momentum of a particle is 1.2×10^{4} kg-ms^{-1}, then what will be its de-Broglie wavelength? (Take $h = 6.6 \times 10^{-34}$ Js)

a) 3×10^{-29}m
b) 5.5×10^{-29}nm
c) 6.4×10^{-29}m
d) 6×10^{-29}nm

42. What is the maximum kinetic energy observed when two identical metal plates are subjected to the photoelectric effect, with plate A illuminated by light of wavelength λ A and plate B illuminated by light of wavelength λ_B (where $\lambda_A = 2\lambda_B$)?

a) $2\,K_A = K_B$
b) $K_A < K_B/2$
c) $K_A = 2K_B$
d) $K_A = K_B/2$

43. An electron collides with a hydrogen atom in its ground state and excites it to n=4. The energy given to hydrogen atom in this inelastic collision is (neglect the recoiling of hydrogen atom)

a) 10.2 eV
b) 12.75 eV
c) 12.5 eV
d) None of these

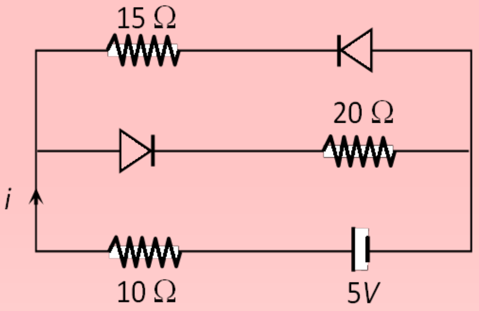
44. Determine the energy released during the fusion of three alpha particles to form a carbon-12 ^{12}C nucleus. Given that the atomic mass of a helium-4 $_{2}He^{4}$ particle is 4.002603 atomic mass units (u), calculate the corresponding mass defect.

a) 0.007809 u
b) 0.002603 u
c) 4.002603 u
d) 0.5 u

45. In a common-emitter amplifier, the load resistance of the output circuit is 1200 times the resistance of the input circuit. If $\alpha = 0.98$, then voltage gain is

a) 4.8×10^{3}
b) 2.4×10^{2}
c) 1.5×10^{2}
d) 4.8

46. Current in the circuit will be

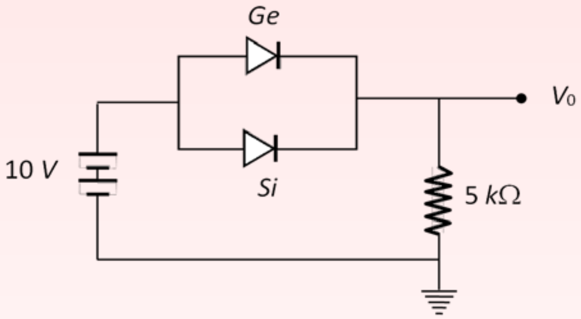


a) $\frac{5}{10}$ A   b) $\frac{5}{55}$ A   c) $\frac{5}{15}$ A   d) $\frac{5}{20}$ A

47. What would be the behaviour of a germanium sample after adding traces of gallium as an impurity?

a) A conductor   b) A P-type semiconductor
c) An N-type semiconductor   d) An insulator

48. If the connection of the Ge diode is reversed in the given circuit, which initially had Ge and Si diodes conducting at 0.3 V and 0.7 V, respectively, how will this reversal affect the value of V_0 in the figure?



a) 0.2 V   b) 0.4 V   c) 0.6 V   d) 0.8 V

49. The grid voltage of any triode valve is changed from -2 volt to -3 volt and the mutual conductance is 5×10^{-4} mho. The change in plate circuit current will be

a) 0.8 mA   b) 0.6 mA   c) 0.5 mA   d) 1 mA

50. Consider telecommunication through optical fibres. Which of the following statements is not true?

a) Optical fibres may have homogeneous core with a suitable cladding.
b) Optical fibres are subject to electromagnetic interference from outside.
c) Optical fibres can be of graded refractive index
d) Optical fibres have extremely low transmission loss

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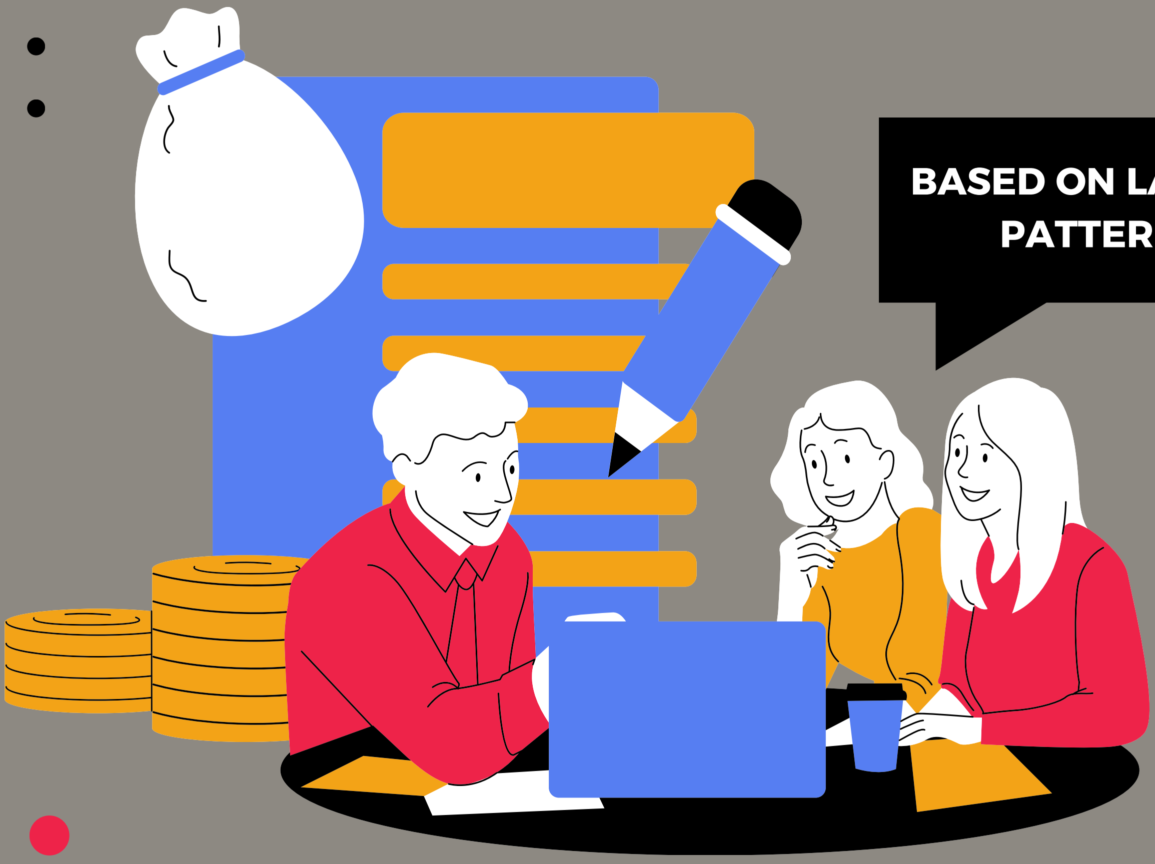
Sample Paper Solution 1



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---------------------------ANSWER KEY----------------------------------

1)	d	2)	d	3)	c	4)	a
5)	b	6)	c	7)	c	8)	b
9)	b	10)	c	11)	c	12)	d
13)	b	14)	b	15)	b	16)	c
17)	a	18)	d	19)	d	20)	b
21)	c	22)	c	23)	c	24)	b
25)	c	26)	c	27)	d	28)	d
29)	b	30)	a	31)	c	32)	c
33)	b	34)	b	35)	c	36)	b
37)	c	38)	a	39)	a	40)	d
41)	b	42)	b	43)	b	44)	a
45)	a	46)	b	47)	b	48)	c
49)	c	50)	b				

HINTS AND SOLUTIONS

1. **(d)**
   Theory

2. (d)
   Coulomb's Law is applicable only for point charges.

3. **(c)**
   The force between the electrons can be determined from the Coulomb’s law of electric charges. This law is also called the inverse square law. Where, the force is inversely proportional to the square of the distance. And the force is also called the electrostatic force.

4. **a)**

Work done by electrostatic force is
W= q (V_B -V_A)
=q (-40-20) = -60 q J
= 9.6× 10^{-19} J

5. **b)**

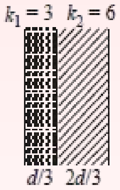
Potential at the centre of hollow metallic Sphere is given by $V = \frac{1}{4\pi\varepsilon_0}\frac{Q}{R}$

6. **c)**

$V_Q - V_P = E\,(R_Q - R_P)$
= 10(4 – 0)
= 40V

7. **c)**
8. **b)**

(d) : $C = \frac{\varepsilon_0 A}{d} = 9\times10^{-12}$ F



With dielectric, $C = \frac{\varepsilon_0 kA}{d}$

$C_1 = \frac{\varepsilon_0 A\cdot 3}{d/3} = 9C$;

$C_2 = \frac{\varepsilon_0 A\cdot 6}{2d/3} = 9C$

$\therefore\ C_{total} = \frac{C_1C_2}{C_1+C_2}$ as they are in series.

$= \frac{9C\times9C}{18C} = \frac{9}{2}\times C$ or $\frac{9}{2}\times9\times10^{-12}$ F

$\Rightarrow\ C_{total} = 40.5$ pF.

9. **b)**

$$C_{eq} = \frac{\epsilon_0 A}{d} + \frac{\epsilon_0 A}{d}$$

10. **c)**

Hint-
The radius of soap bubble increases
because of outward energy following up at the bubble because of charging

11. **c)**
    As we know,

$$I = Q/t$$

where Q= ne (number of electrons × charge on each electron which is 1.6×10^{-19})
Therefore,

$$I = \frac{ne}{t}$$

$$= 62.5 \times 1018 \times 1.6 \times 10 - 19 / 1$$
$$= 10\ A$$

12. **d)**
    Value of current,

$$\text{Current} = \frac{\text{net emf}}{\text{net resistance}}$$

or $I = \frac{5+5+5}{1+1+1+3} = \frac{15}{6} = 2.5A$

13. **b)**

$$S = \frac{i_g G}{(i - i_g)} = \frac{1\times0.1}{10-2} = \frac{0.01}{8}$$
$$= 0.00125\Omega$$

14. b)
    In mechanics momentum is,

$$p = mv$$

Similarly, here for electrons in conductor momentum pc(say) is

$$pc = m\,N\,vd \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where, m is mass of electrons, N is number of free electrons per unit length

of conductor and v_d is the drift velocity.

Number of free electrons per unit length of conductor is

$$N = l\,n\frac{A}{l}$$
$$= nA$$
$$vd = \frac{i}{ne}A$$

where, variables have their usual meanings.

Using above values, equation (1) becomes

$$pc = m\left(\frac{\boldsymbol{i}}{neA}\right)(nA)$$

$$pc = \frac{i}{me}$$
$$pc = \frac{i}{S}$$

where, S=me, specific charge on an electron.

15. b)

Chemical equivalent of gold $= \frac{197.1}{3} = 65.7$

Gold to be deposited $= \frac{400\times 5}{100}$ =20g

Electrochemical equivalent of gold

$$z_2 = \frac{W_2}{W_1} z_1\, z_2$$
$$= \frac{65.7}{1.008} \times 0.1044 \times 10^{-4}\mathrm{gC}^{-1}$$

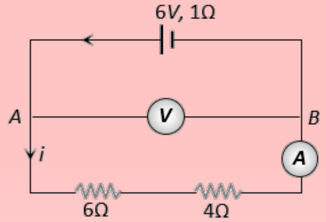
Also $m = zlt, t = \frac{m}{zl}$

$$\Rightarrow = \frac{20}{\left(\frac{65.7}{1.008} \times 0.1044 \times 10^{-4} \times 2\right)}$$

= 14695.8s

16. c)

The given circuit can be redrawn as follows



Current $i = \frac{6}{6+4+1} = \frac{6}{11}A$

P.D. between A and B,

$$V = \frac{6}{11} \times 10 = \frac{60}{11}V$$

17. (a)

The minimum value of magnetic field

$$B = \frac{F}{qv\sin 90°}$$
$$= \frac{10^{-9}}{2\times 10^{-12}\times 10^{5}}$$
$$= 5\times 10^{-3}\ \mathrm{T\ in}\ z-\mathrm{direction}$$

18. (d)

Cyclotron frequency is given by

$$v = \frac{qB}{2\pi m}$$
$$\therefore v = \frac{1.6\times 10^{-19}\times 6.28\times 10^{-4}}{2\times 3.14\times 1.7\times 10^{-27}}$$
$$= 0.94\times 10^{4} \approx 10^{4}\ \mathrm{Hz}$$

19. (d)

$$B = \frac{F}{m} = \frac{2}{9\times 10^{-2}}$$
$$= 22.2\ \mathrm{T\ or}\ 22.2\ \mathrm{Wbm}^{-2}$$

20. (b)

$$Bqv = \frac{mv^2}{r} \Rightarrow r$$
$$= \frac{mv}{Bq} \qquad \ldots (i)$$

Since particle was initially at rest and gained a velocity v due to a potential difference of V volt. So,

KE of particle $= \frac{1}{2}mv^2 = qV$

$$v = \sqrt{\frac{2qV}{m}} \qquad \ldots (ii)$$

From Eqs. (i) and (ii), we get

$$r = \frac{m}{Bq}\sqrt{\frac{2qV}{m}}$$

$$r = \frac{1}{B}\sqrt{\frac{2mV}{q}}$$

∴ Diameter of the circular path

$$d = 2r = \frac{2}{B}\sqrt{\frac{2mV}{q}}$$

21. (c)

Magnetic field at mid-point M in first case is

$B = B_{PQ} - B_{RS}$

(∴ B_{PQ} and B_{RS} are in opposite directions)

$$= \frac{4\,\mu_0}{4\pi d} - \frac{2\,\mu_0}{4\pi d} = \frac{2\,\mu_0}{4\pi d}$$

When the current 4 A is switched off, the net magnetic field at M is due to current 1 A

$$B' = \frac{\mu_0 \times 4 \times 1}{4\pi d} = \frac{B}{2}$$

22. (c)

Let M_1 and M_2 be the magnetic moments of magnets and H the horizontal component of earth's field. We have $\tau = MH\sin\theta$. If ϕ is the twist of wire, then $\tau = C\phi$, C being restoring couple per unit twist of wire

$\Rightarrow C\phi = MH\sin\theta$

Here $\phi_1 = (180° - 30°) = 150° \times \frac{\pi}{180} rad$

$\phi_2 = (270° - 30°) = 240° = 240 \times \frac{\pi}{180} rad$

So, $C\phi_1 = M_1 H\sin\theta$ [For deflection $\theta = 30°$ of I magnet]

$C\phi_2 = M_2 H\sin\theta$ [For deflection $\theta = 30°$ of II magnet]

Dividing $\frac{\phi_1}{\phi_2} = \frac{M_1}{M_2}$

$$\Rightarrow \frac{M_1}{M_2} = \frac{\phi_1}{\phi_2} = \frac{150 \times \left(\frac{\pi}{180}\right)}{240 \times \left(\frac{\pi}{180}\right)} = \frac{15}{24} = \frac{5}{8}$$

$$\Rightarrow M_1 : M_2 = 5 : 8$$

23. (c)

Magnetic substance when kept in a magnetic field is feebly repelled or thrown out if the substance is diamagnetic.

24. (b)

Here, $n_1 = 10$ oscillations per min

$\delta_1 = 45°, T_1 = 0.707$ CGS units

$n_2 = ?, \delta_2 = 60°, R_2 = 0.5$ CGS units

$$\frac{n_2}{n_1} = \sqrt{\frac{H_2}{H_1}} = \sqrt{\frac{R_2 cos\delta_2}{R_1 cos\delta_1}}$$

$$\frac{n_2}{10} = \sqrt{{}^{\circ}\frac{0.5\cos 60°}{0.707\cos 45°}} =$$

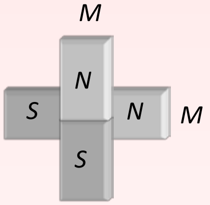
$$\sqrt{\frac{0.5 \times 1/2}{0.5 \times \sqrt{2} \times 1/\sqrt{2}}} = \frac{1}{\sqrt{2}}$$

$$n_2 = \frac{10}{\sqrt{2}} = 7.07$$

25. (c)

Time period of combination

$$T = 2\pi\sqrt{\frac{2I}{\sqrt{2}M.H}} \qquad \text{... (i)}$$



and time period of each magnet

$$T' = 2\pi\sqrt{\frac{I}{MH}} \qquad \text{... (ii)}$$

From (i) and (ii), we get

$$T' = \frac{T}{2^{1/4}} = 2^{-1/4}T$$

26. (c)

$$B_1 = \frac{2M}{d^3}, B_2 = \frac{M}{d^2};\ \therefore \frac{B_1}{B_2} = 2 : 1$$

27. (d)

The emf induced will be

$$e = vBl = 2 \times 0.75 \times 3 = 4.5\ \text{V}$$

28. (d)

$$irms = \frac{i_0}{\sqrt{2}} = \frac{4}{\sqrt{2}} = 2.836\ \text{A}$$

29. (b)

Hot wire ammeter reads rms value of current. Hence its peak value $= i_{rms} \times \sqrt{2} = 28.28\ amp$

30. (a)

The applied voltage is given by $V = \sqrt{V_R^2 + V_L^2}$

$$V = \sqrt{(300)^2 + (150)^2} = 335.41\ volt$$

31. (c)

Phase difference $\Delta\phi = \phi_2 - \phi_1 = \frac{\pi}{6} - \left(\frac{-\pi}{6}\right) = \frac{\pi}{3}$

32. (c)

According to Maxwell, a changing electric field is a source of magnetic field

33. (b)

The electric field induced by changing magnetic field depends upon the rate of change of magnetic flux, hence it is non-conservative

34. (b)

$U = \frac{1}{2} \times \frac{1}{2}\varepsilon_0 E^2 = \frac{1}{2} \times \frac{1}{2} \times 8.85 \times 10^{-12} \times (2)^2$

$= 8.85 \times 10^{-12}\text{Jm}^{-3}$

35. (c)

Total power=solar constant × area

$$= 10^4 \times (10 \times 10) = 10^6\ \text{W}$$

36. (b)

Infrared radiations are detected by pyrometer

37. (c)

$$m \simeq \frac{LD}{f_o f_e} \Rightarrow m = \frac{5 \times 25}{0.5 \times 0.2} = 1250$$

38. (a)

Condition of no emergence is

$A > C$

As angle of prism is greater than critical angle for blue and green coloured rays, total internal reflection will take place at second surface and hence the arrangement will separate red colour from blue and green.

39. (a)

$$\lambda = \frac{c}{v} = \frac{3 \times 10^8}{7.6 \times 10^6} = 39.5m$$

40. (d)

The angular position of first diffraction minimum is

$\sin\theta = \frac{\lambda}{a}$

The phase difference is,

$$\phi = \frac{2\pi}{\lambda} \times \Delta x$$

$$\phi = \frac{2\pi}{\lambda} \times \lambda$$

$$\phi = 2\pi$$

41. (b)

Given, the linear momentum of particle (p)

$$= 1.2 \times 10^4 \text{kg} - \text{ms}^{-1}$$

$$\text{h} = 6.6 \times 10^{-34}\ \text{JS}$$

The de-Broglie wavelength of particle

$$\lambda = \frac{\text{h}}{\text{p}}$$

$$\lambda = \frac{6.6\times10^{-34}}{1.2\times10^4}$$

Or $\lambda = 5.5 \times 10^{-38}$ m

Or $\lambda = 5.5 \times 10^{-29}$ mm

42. (b)

$\text{K}_\text{A} = \frac{\text{hc}}{\lambda_\text{A}} - \phi_0$ and $\text{K}_\text{B} = \frac{\text{hc}}{\lambda_\text{B}} - \phi_0$

$$\frac{\text{K}_\text{A}}{\text{K}_\text{B}} = \frac{\frac{\text{hc}}{2\lambda_\text{B}}}{\frac{\text{hc}}{\lambda_\text{B}}} < \frac{1}{2} \text{ or } \text{K}_\text{A} < \text{K}_\text{B}/2$$

43. b)

The energy taken by hydrogen atom corresponds to its transition from

n =1 to n =4 state.

ΔE (given to hydrogen atom)

$= 13.6\left(1 - \frac{1}{16}\right)$

$= 13.6 \times \frac{8}{9} = 12.75\text{eV}$

44. (a)

Mass defect

Δm=Total mass of α-particles-mass of ^12 C nucleus

$= 3 \times\ 4.002603 - 12$

$= 12.007809 - 12$

$= 0.007809$ unit

45. (a)

Given, $\beta = \frac{\alpha}{1-\alpha} = \frac{0.8}{1-0.8} = 4$

∴ Voltage gain

$= \beta\frac{R_2}{R_1} = 4 \times 1200 = 4.8 \times 10^3$

46. (b)

The diode in lower branch is forward biased and diode in upper branch is reverse biased

$$\therefore \text{i} = \frac{5}{25 + 20} = \frac{5}{55}\text{A}$$

47. (b)

Gallium is trivalent impurity

When it is added to the germanium, extra hole is created in lattice by each gallium atom. Hole is assumed to have a positive charge on it, hence germanium will behave like a p-type semiconductor.

48. (b)

Consider the case when Ge and Si diodes are connected as show in the given figure.

Equivalent voltage drops across the combination Ge and Si diode = 0.15 V

$\Rightarrow$ Current i $= \frac{10-0.3}{5\ \text{k}\Omega} = 1.94$ mA

∴ Out put voltage $V_0 = Ri = 5\ \text{k}\Omega \times 1.94\ \text{mA} = 9.7\ \text{V}$

Now consider the case when diode connection is reversed. In this case vo combination = 0.7 V

$\Rightarrow$ Current i $= \frac{10-0.7}{5\ \text{k}\Omega} = 1.86$ mA

$\therefore V_0 = iR$

$= 1.86\ \text{mA} \times 5\ \text{k}\Omega = 9.3\ \text{V}$

Hence charge in the value of $V_0 = 9.7 - 9.3 = 0.4$ V

Voltage drop across the diode’s

49. c)

By using $g_m = \frac{\Delta i_p}{\Delta v_g} \Rightarrow 5 \times 10^{-4} = \frac{\Delta i_p}{-2-(-3)}$

$\Rightarrow \Delta i_p = 5 \times 10^{-4} A = 0.5\ mA$

over long distances.

50. **(b)**
Optical fibre cables are immune to electromagnetic interference because they transmit signals as light pulses through a glass or plastic core, without the use of electrical current. Unlike traditional electrical cables, there are no generated magnetic fields, and fluctuations in the induced magnetic field outside the conductor cannot interfere with the transmitted signals. This inherent immunity makes optical fibre cables highly reliable and efficient for high-speed data transmission

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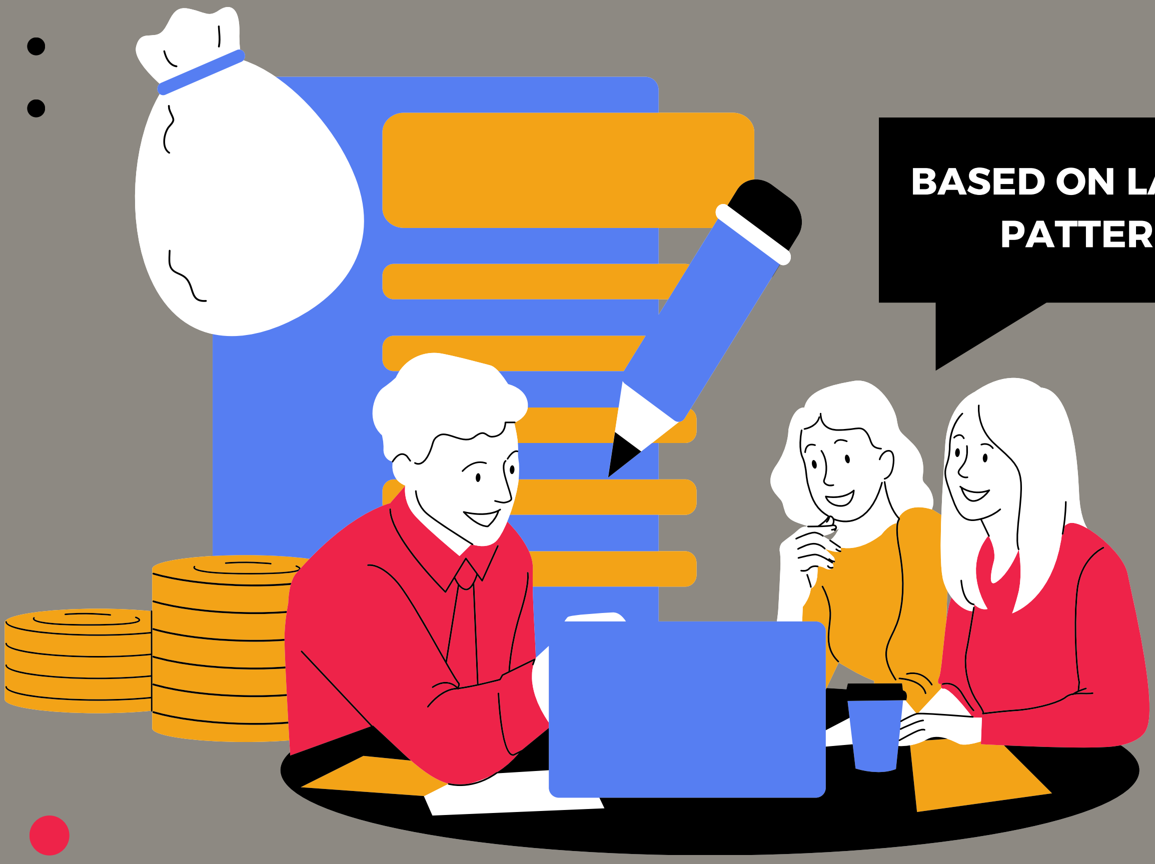
PHYSICS

Sample Paper 2



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CUET PEATICE PAPER- 2

PHYSICS

1. A soap bubble is given a negative charge, then its radius
a) decreases
b) increases
c) remains unchanged
d) nothing can be predicted as information is insufficient

2. If two bodies are rubbed and one of them acquires q1 charge and another acquires q2 charge, then ratio of q1: q 2 is
a) 1: 2 b) 2: 1 c) – 1: 1 d) 1: 4

3. An electric shock is experienced on opening the door of a car due to
a) heating of car engine
b) motion of car
c) discharge of electric charge
d) None of the above 2

4. The electric potential inside a conducting sphere
a) Increases from centre to surface c) Remains constant from centre to surface
b) Decreases from centre to surface d) Is zero at every point inside

5. Two parallel conducting plates of a capacitor of capacitance C containing charges Q and--2Q at a distance d apart. Find out potential difference between the plates of capacitors.
a) 2Q b)3Q c)3Q/2C d)4Q

6. A slab of material of dielectric constant K has the same area as the plates of a parallel plate capacitor but has a thickness ¾ d where d is the separation of the plates. The ratio of capacitance C (in the presence of dielectric) to the Capacitance C_0 (in the absence of the dielectric) is
a) 3K/K+4 b) 3K/4 c) 4K/K+3 d) 4K/3

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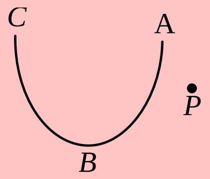
7. In the following diagram the work done in moving a point charge from point P to point A, B and C is respectively as W_A, W_B and W_C then



a) $W_A = W_B = W_C$ b) $W_A = W_B = W_C = 0$ c) $W_A > W_B > W_C$ d) $W_A < W_B < W_C$

8. The charges Q, -q and -q are placed at the vertices of an equilateral triangle of side $10cm$. The potential at the midpoint in between −q and -q, if q=5μC is:

a) -6.4×10^5 V b) -12.8×10^4 V c) 6.4×10^5 V d) -12.8×10^5 V

9. The potential energy of system of two equal negative point charges of 2μC each held 1m apart in air is ($k = 9 \times 10^9$ SI unit)

a) 36J b) 3.6×10^{-3} J c) 3.6 J d) 3.6×10^{-2} J

10. The plate separation in a parallel plate condenser is d and plate area is A. If it is charged to V volt and battery is disconnected then the work done in increasing the plate separation to 2d will be

a) $\frac{3\epsilon_0 A V^2}{2d}$ b) $\frac{\epsilon_0 A V^2}{d}$ c) $\frac{2\epsilon_0 A V^2}{d}$ d) $\frac{\epsilon_0 A V^2}{2d}$

11. In a closed box, there is a series connection of twelve cells, each with an electromotive force (emf) of E volts. However, some of these cells are wrongly connected with their positive and negative terminals reversed. The circuit includes an ammeter, an external resistance of R ohms, and a two-cell battery (consisting of cells of the same type as the previous ones) connected perfectly in series. When the 12-cell battery and the 2-cell battery are aiding each other, the current in the circuit is measured as 3A. Conversely, when they oppose each other, the current is measured as 2A. Determine the number of cells in the 12-cell battery that are connected incorrectly.

a) 4 b) 3 c) 2 d) 1

12. An ammeter gives full scale deflection when current 2.0 A is passed in it. To convert it into 10 A range ammeter, the ratio of its resistance and the shunt resistance will be.

a) 1: 8 b) 1: 10 c) 4: 1 d) 2: 1

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13. In a metallic conductor with a non-uniform cross-section, which of the following quantity or quantities remain constant along the length of the conductor as the current flows steadily

a) current, electric field, drift speed
b) drift speed only
c) current and drift speed
d) current only

14. The relation between Electric field (E) and current density (J) is

a) $E \propto J^{-1}$ b) $E \propto J$ c) $E \propto \frac{1}{J^2}$ d) $E^2 \propto \frac{1}{J}$

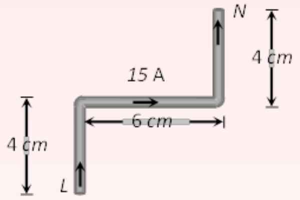
15. *A wire* 150cm *long and* 1.0 mm *diameter has a resistance of* 0.9 ohm, *the electrical resistivity of the material is*

a) 6.36×10^{-6} ohm × m b) 2.23×10^{-6} ohm × m
c) 1.17×10^{-6} ohm × m d) 3.18×10^{-6} ohm × m

16. A brass rectangular plate 15cm × 5cm is to be electroplated with copper. If we wish to coat it with a layer of 0.02 mm thick both sides, how much time will it take with a constant current of 2A? Given ECE of copper is $33 \times 10^{-5}\text{g C}^{-1}$ and density of copper is 8.9 g cm^{-3}.

a) 2025 s b) 4060 s c) 4000 s d) 8000

17. When a wire AB carrying a current of 15 A is bent into the shape depicted below and placed in a magnetic field of 3 T, which is perpendicular to the plane of the paper and directed outward, the wire will undergo a force. Determine the value of force.

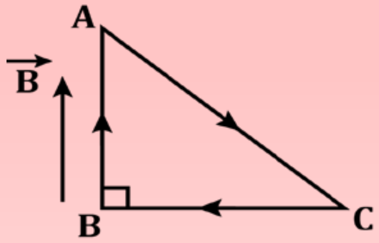


a) Zero b) 5 N c) 3 N d) 4.5 N

18. When a beam of electrons passes through mutually perpendicular electric and magnetic fields, it remains undeflected. However, if the electric field is switched off while maintaining the same magnetic field, the electrons will continue to move in

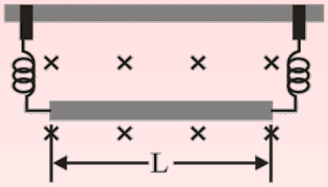
a) In an elliptical orbit b) In a circular orbit
c) Along a parabolic path d) Along a straight line

19. Consider a closed loop in the shape of a right-angled isosceles triangle ABC, carrying a current. The loop is placed in a uniform magnetic field that is aligned with the side AB. If the magnetic force experienced by the side BC is denoted as F, determine the force exerted on the side AC of the triangle.



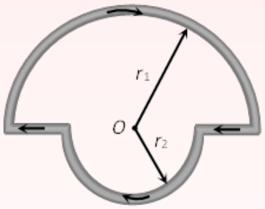
a) $-\sqrt{2}F$ b) -F c) F d) $\sqrt{2}F$

20. A 44.0g wire of length L=98.0cm is suspended by a pair of flexible leads in a uniform magnetic field of magnitude 0.440 T (see figure). What is the (a) magnitude and (b) direction (left or right) of the current required to remove the tension in the supporting leads?



a) *10A, right* *b) 20A left* *c) 10 A left* *d) none of these*

21. Consider the figure shown, which consists of two semicircles with radii r_1 and r_2, through which a current i is flowing. Find the magnetic induction at the centre point O.



a) $\frac{\mu_0 i}{r}(r_1 + r_2)$ b) $\frac{\mu_0 i}{4}(r_1 - r_2)$ c) $\frac{\mu_0 i}{4}\left(\frac{r_1 + r_2}{r_1 r_2}\right)$ d) $\frac{\mu_0 i}{4}\left(\frac{r_2 - r_1}{r_1 r_2}\right)$

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22. A magnetic dipole is placed at right angles to the direction of lines of force of magnetic induction B. If it is rotated through an angle of 180°, then the work done is

a) MB b) $2\ MB$ c) $-2\ MB$ d) Zero

23. A domain in a ferromagnetic substance is in the form of a cube of side length $1\ \mu m$. If it contains 8×10^{10} atoms and each atomic dipole has a dipole moment of $9 \times 10^{-24}\ A\ m^2$, then magnetization of the domain is

a) $7.2 \times 10^5\ \mathrm{A\ m^{-1}}$ b) $7.2 \times 10^3\ \mathrm{A\ m^{-1}}$ c) $7.2 \times 10^9\ \mathrm{A\ m^{-1}}$ d) $7.2 \times 10^{12}\ \mathrm{A\ m}$

24. A bar magnet is placed north-south with its north pole due north. The points of zero magnetic field will be in which direction from center of magnet

a) North and south b) East and west
c) North-east and south-west d) North-east and south-east

25. If a magnetic dipole of dipole moment M rotated through an angle θ with respect to the direction field H, then the work done is

a) $MH \sin\theta$ b) $MH(1-\sin\theta)$ c) $MH\cos\theta$ d) $MH(1-\cos\theta)$

26. The magnetic moment of a magnet is $0.1\ \mathrm{amp} \times \mathrm{m}^2$. It is suspended in a magnetic field of intensity$3 \times 10^{-4}\ \mathrm{Wbm^{-2}}$. The couple acting upon it when deflected by 30° from the magnetic field is

a)$1 \times 10^{-5}\mathrm{N\ m}$ b) $1.5 \times 10^{-5}\mathrm{N\ m}$ c) $2 \times 10^{-5}\mathrm{N\ m}$ d) $2.5 \times 10^{-5}\mathrm{N\ m}$

27. A coil of 500 turns is wound on a book and this book is lying on the table. The vertical component of earth's magnetic field is 0.9×10^{-4} T and the area of the coil is $0.1\ \mathrm{m^{-2}}$. The book is turned over once about a horizontal axis is 0.5 s. This average emf induced in the coil is

a) 0.03 V b) 0.018 V c) Zero d) 2.5 V

28. In a transformer with a primary winding of 300 turns and a secondary winding of 100 turns, if the current in the secondary winding is 60 A, determine the current in the primary winding.

a) 20 A b) 80 A c) 160 A d) 800

29. If an 7 Ω resistance and 13 Ω reactance is present in an ac series circuit, then the impedance of the circuit will be

a) 20 ohm b) 5 ohm c) 10 ohm d) $14\sqrt{2}$ ohm

30. The frequency of an alternating voltage is 20 cycles/sec and its amplitude is 200V. Then the r. m. s. value of voltage is

a) 141.3V b) 84.8V c) 70.7V d) 56.5V

31. The instantaneous values of current and emf in an ac circuit are $I = 1/2 \sin 314\,t$ amp and $E = \sqrt{3} \sin(314\,t - \pi/6)$ V respectively. The phase difference between E and I will be

a) $-\pi/6$ rad b) $-\pi/3$ rad c) $\pi/6$ rad d) $\pi/3$ rad

32. Ground waves have wavelength

a) Less than 200 m b) Equal to 200 m c) More than 200 m d) All of these

33. A plane Electromagnetic Waves travelling along the X-direction has a wavelength of 3 mm. The variation in the electric field occurs in the Y-direction with an amplitude 66 Vm^{-1}. The equations for the electric and magnetic fields as a function of x and t are respectively

a) $E_y = 33 \cos \pi \times 10^{11}\left(t - \frac{x}{c}\right)$,

$B_z = 1.1 \times 10^{-7} \cos \pi \times 10^{11}\left(t - \frac{x}{c}\right)$

b) $E_y = 11 \cos 2\pi \times 10^{11}\left(t - \frac{x}{c}\right)$,

$B_y = 11 \times 10^{-7} \cos 2\pi \times 10^{11}\left(t - \frac{x}{c}\right)$

c) $E_x = 33 \cos \pi \times 10^{11}\left(t - \frac{x}{c}\right)$,

$B_x = 11 \times 10^{-7} \cos \pi \times 10^{11}\left(t - \frac{x}{c}\right)$

d) $E_y = 66 \cos 2\pi \times 10^{11}\left(t - \frac{x}{c}\right)$,

$B_z = 2.2 \times 10^{-7} \cos 2\pi \times 10^{11}\left(t - \frac{x}{c}\right)$

34. The frequency 1057 MHz of radiation arising from two close energy levels in hydrogen belongs to

a) Radio waves b) Infrared waves c) Micro waves d) $\gamma -$ rays

35. Maxwell in his famous equation of electromagnetism introduced the concept

a) AC current b) DC current c) Displacement current d) Impedance

36. In a plane electromagnetic wave electric field varies with time having an amplitude 1 Vm^{-1}. The frequency of wave is 0.5×10^{15} Hz. The wave is propagation along X-axis. What is the average energy density of magnetic field?

a) $1.1 \times 10^{-12}\,\text{J m}^{-3}$ b) $2.2 \times 10^{-12}\,\text{J m}^{-3}$ c) $3.3 \times 10^{-12}\,\text{J m}^{-3}$ d) $4.4 \times 10^{-12}\,\text{J m}^{-3}$

37. For a telescope with the maximum possible magnification, we would choose the lenses with the longest focal lengths. Therefore, select the lenses with focal lengths of 100 cm and 10 cm.

a) 100 cm, 0.3 cm b) 10 cm, 0.3 cm c) 10 cm, 4 cm d) 100 cm, 4 cm

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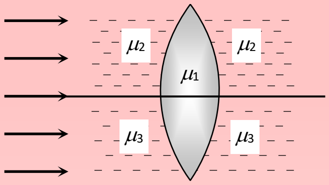
38. In the given setup, a double convex lens made of a material with refractive index μ_1 is positioned between two liquids with refractive indices μ_2 and μ_3, where $\mu_2 > \mu_1 > \mu_3$. When a wide, parallel beam of light is directed towards the lens from the left, the lens will cause the light rays to

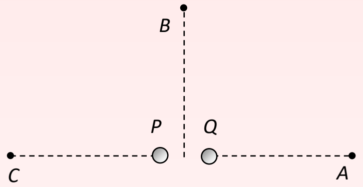


a) A single convergent beam
b) Two different convergent beams
c) Two different divergent beams
d) A convergent and a divergent beam

39. In Young's double slit experiment, carried out with light of wavelength $\lambda = 6000$ Å, the distance between the slits is 0.5 mm and the screen is at 100 cm from the slits. The central maximum is at $x = 0$. The third maximum (taking the central maximum as zeroth maximum) will be at x equal to

a) 1.67 cm
b) 3.6 cm
c) 0.5 cm
d) 5.0 cm

40. In the given figure, P and Q represent two coherent sources with equal intensity, emitting radiation of wavelength 20 m. The separation between P and Q is 5.0 m, and the phase of P is 90° ahead of the phase of Q. A, B, and C are three observation points located equidistantly from the midpoint of PQ. What will be the ratio of the intensities of radiation at points A, B, and C?



a) 0: 1: 4
b) 4: 1: 0
c) 0: 1: 2
d) 2: 1: 0

41. At a rate of 2.5 calories per cm^2 per minute, energy from the sun is received on Earth. Assuming the average wavelength of solar light is 5000 Å, how many photons are received on Earth per cm^2 per minute? (Given: Planck's constant, $h = 6.6 \times 10^{-34}$ Js, and 1 calorie = 4.2 J)

a) 1.5×10^{13}
b) 2.6×10^{13}
c) 2.3×10^{19}
d) 1.75×10^{19}

42. The de-Broglie wavelength is proportional to

a) $\lambda \propto \frac{1}{v}$
b) $\lambda \propto \frac{1}{m}$
c) $\lambda \propto \frac{1}{p}$
d) $\lambda \propto p$

43. Excitation energy of a hydrogen like atom in its first excitation state is 54.4eV. Energy needed to remove the electron from the ion in ground state is

a) 40.8 eV b) 27.2 eV c) 54.4 eV d) 13.6 eV

44. The energy equivalent to 2 mg of matter in MeV is

a) 11.2×10^{22} b) 56.25×10^{24} c) 11.2×10^{26} d) 56.25×10^{28}

45. Approximately, what is the minimum potential difference between the base and emitter needed to turn on a silicon transistor?

a) 1 V b) 3 V c) 5 V d) 4.2 V

46. When testing a functioning transistor with labelled legs A, B, and C using a multimeter, there is no conduction observed between legs A and B. However, connecting the common (negative) terminal of the multimeter to leg C and the other (positive) terminal to either leg A or leg B shows some resistance on the multimeter. Based on this information, what can be deduced about the behaviour or characteristics of the transistor?

a) It is an n-p-n transistor with C as base
b) It is an p-n-p transistor with C as collector
c) It is an p-n-p transistor with C as emitter
d) It is an n-p-n transistor with C as collector

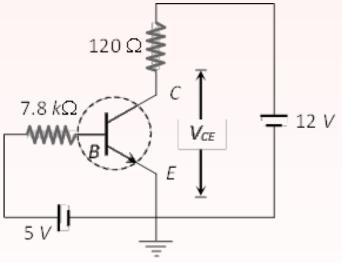
47. A gate has the following truth table

A	1	1	0	0
B	1	0	1	0
C	1	0	0	0

The gate is

a) NOR b) OR c) NAND d) AND

48. For the transistor circuit shown below, if $\beta = 100$, voltage drop between emitter and base is 0.5 V then value of V_{CE} will be



a) 2.4 V b) 5 V c) 4.8 V d) 0 V

49. With a semiconductor material having a band gap of 2.5 eV, what is the wavelength of the signal that can be detected by the p-n photodiode fabricated from this material?

a) 6000 Å b) 4000 nm c) 6000 nm d) 4000 Å

50. This question has statement-1 and statement -2. Of the four choices given after the statements, choose the one that best describes the two statements.

Statement - 1: Sky state of signals are used for long distance radio communication. These signals are in general, less stable than ground wave signals.
Statement -2: The state of ionosphere varies from hour to hour, day to day and seasons to seasons.

a) Statement-1 is true, statement-2 is false.
b) Statement-1 is true, statement-2 is true, statement-2 is the correct explanation of statement-1.
c) Statement-1 is true, statement-2 is true, statement-2 is not the correct explanation of statement-1.
d) Statement-1 is false, statement-2 is true.

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PHYSICS

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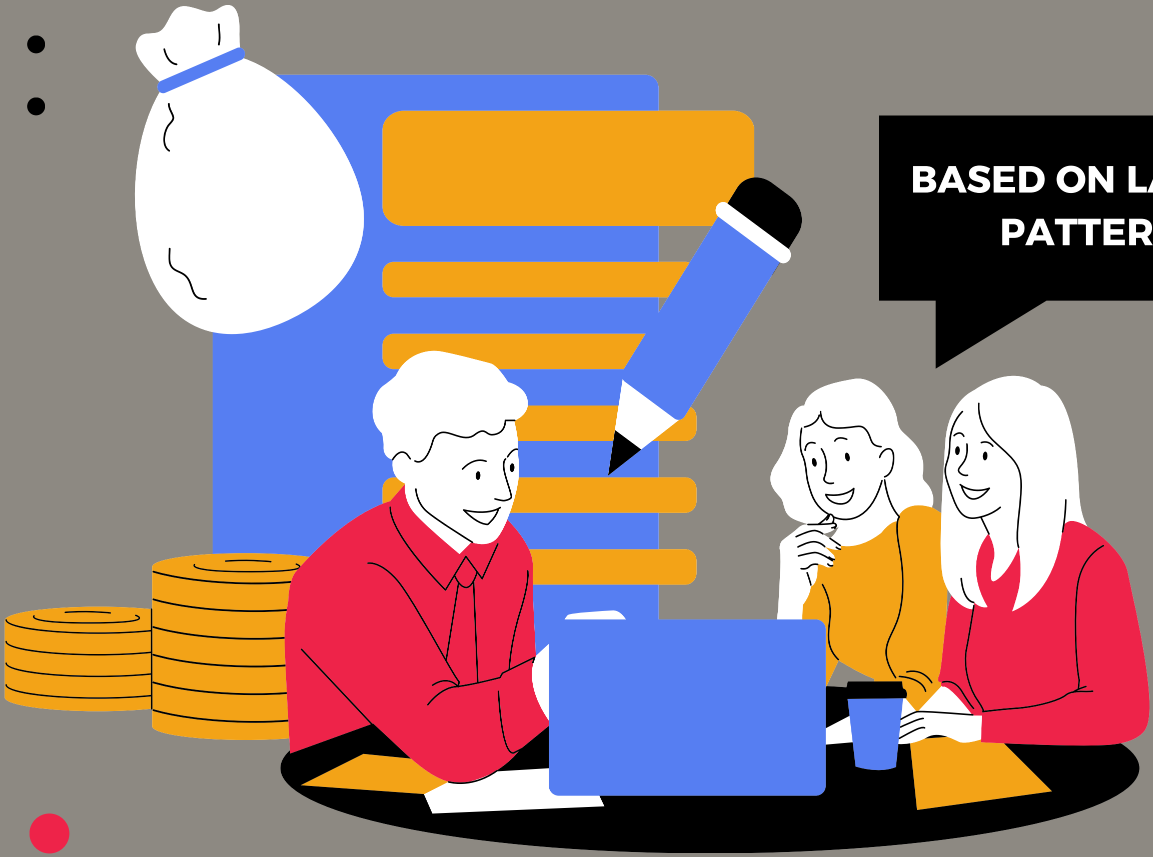

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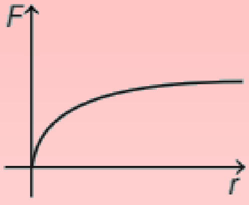
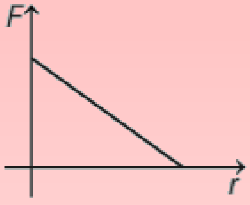
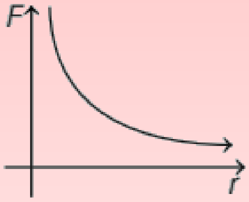
CUET PRATICE PAPER- 3

PHYSICS

1. Force between two charges varies with distance between them as

(a)


(b)


(c)


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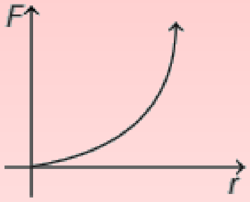


2. If point charges Q1 7 = ´ 2 10- C and Q2 7 = ´ 3 10- C are at 30 cm separation, then find electrostatic force between them.

a) $2 * 10^{-3}$ N b) $6 * 10^{-3}$ N c) $5 * 10^{-3}$ N d) $1 * 10^{-3}$ N

3. The electric field at a point is
a) always continuous
b) continuous, if there is no charge at that point
c) continuous, if there is a charge at that point
d) None of the above

4. Force acting upon a charged particle kept between the plates of a charged condenser is F. If one plate on the condenser is removed, then the force acting on the same particle will become

a) 0 b) F/2 c) F d) 2F

5. A parallel- plate capacitor is charged from a cell and then isolated from it. The separation between the plates is now increased.
   a) The force of attraction between the plates will decrease.
   b) The field in the region between the plates will not change
   c) The energy stored in the capacitor will increase
   d) The potential difference between the plates will decrease

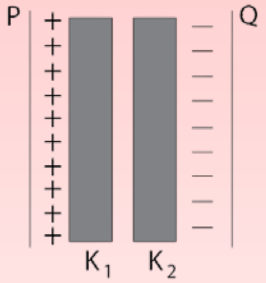
6. A capacitor of capacitance C is charged to a potential difference V from a cell and then disconnected from it. A charge +Q is now given to its positive plate. The potential difference across the capacitor is now

a) V b) V+ Q/C c) V + Q/2C d) V- Q/C

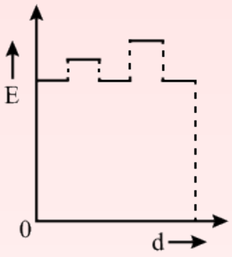
7. To form a composite 10 μF, 200 V capacitor from a supply of identical capacitors marked 10 μF,50 V, we require a minimum number of capacitors

a) 8 b) 16 c) 24 d) 32

8. Two thin dielectric slabs of dielectric constants K1 and K2(K1<K2) are inserted between plates of a parallel plate capacitor, as shown in the figure. The variation of electric field 'E' between the plates with distance 'd' as measured from plate P is correctly shown by:



a)



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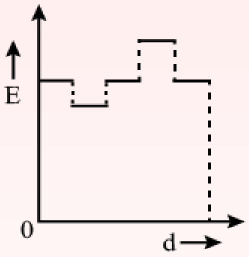

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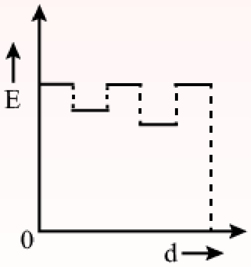

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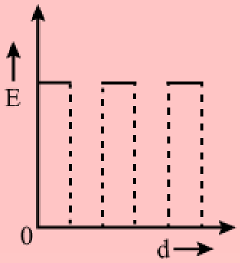
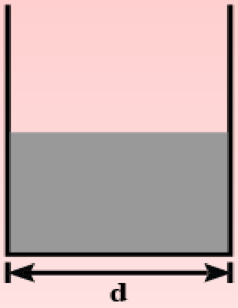


9. A parallel plate air capacitor has a capacitance C. When it is half filled with a dielectric of dielectric constant 5, the percentage increase in the capacitance will be



a) 400% b) 66.6% c) 33.3% d) 200%

10. The capacitance C of a capacitor is
    a) Independent of the charge and potential of the capacitor
    b) Dependent of the charge and potential of the capacitor
    c) Independent of the geometrical configuration of the capacitor
    d) Independent of the dielectric medium between the two conducting surfaces of the capacitor

11. The specific resistance of manganin is 20×10^{-8} ohm × m. The resistance of a cube of length 100cm will be

a) 10^{-6} ohm b) 0.2×10^{-6} ohm c) 10^{-8} ohm d) 5×10^{-4} ohm

12. Conductors have fairly large currents because

    a) The electron drift speed is usually very large

    b) The number density of free electrons is very high and this can compensate for the low values of the electron drift speed and the very small magnitude of the electron charge

    c) The number density of free electrons as well as the electron drift speeds are very large and these compensate for the very small magnitude of the electron charge

    d) The very small magnitude of the electron charge has to be divided by the still smaller product of the number density and drift speed to get the electric current

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13. The expression for the current in a conductor as a function of time is given by I = 5t + 3t^2, where I is measured in amperes (A) and t is measured in seconds (s). Determine the electric charge that flows through a section of the conductor between t = 1s and t = 3s.

a) 10 C b) 39 C c) 33 C d) 44 C

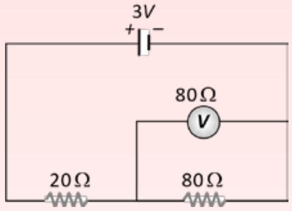
14. A silver voltameter of resistance 5 ohm and a 6 ohm resistor is connected in series across a cell. If a resistance of 2 ohm is connected in parallel with the voltameter, then the rate of deposition of silver

a) Decreases by 25% b) Increases by 25% c) Increases by 37.5% d) Decreases by 37.5%

15. The $V - i$ graph for a good conductor makes angle 60° with V −axis. Here V denotes voltage and i denotes current. The resistance of the conductor will be

a) sin 40° b) cot 60° c) tan 40° d) cos 60°

16. The e m f of the cell is 3 volt and the internal resistance is negligible. The resistance of the voltmeter is 80 ohm. The reading of the voltmeter will be



a) 0.80 *volt* b) 1.60 *volt* c) 1.33 *volt* d) *2.0 volt*

17. Let's consider a wire loop PQR in the shape of a right-angled triangle, where PQ = 2x, PR = 5x, and QR = 7x. A steady current I flows through this wire loop. The magnitude of the magnetic field at point P, caused by this wire loop, is given as:
K (μ_0 I)/(24πx). Determine the value of k.

a) 8 b) 3 c) 7 d) None of these

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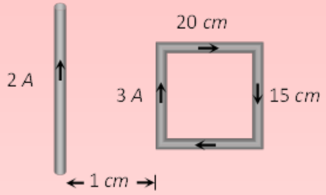
18. Consider two wires, A and B, with lengths 50 cm and 30 cm, respectively. Wire A is bent into a circle of radius r, while wire B is bent into an arc of radius r. A current i_1 passes through wire A, and a current i_2 passes through wire B. To achieve the same magnetic inductions at the centre, determine the ratio of i_1 to i_2.

a) 3: 4　　b) 3: 5　　c) 2: 3　　d) 4: 3

19. The net force on the square coil is:

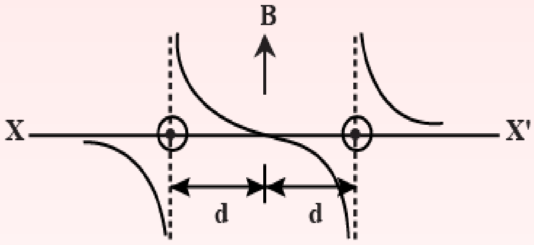


a) 25×10^{-7}N moving towards wire　　b) 25×10^{-7}N moving away from wire
c) 32×10^{-7}N moving towards wire　　d) 32×10^{-7}N moving away from wire

20. Let's consider a situation where two long parallel wires are placed 2d units apart. These wires carry equal and steady currents flowing out of the plane of the paper, as shown. The magnetic field along the line XX' varies according to the given expression or function.

1.

a)



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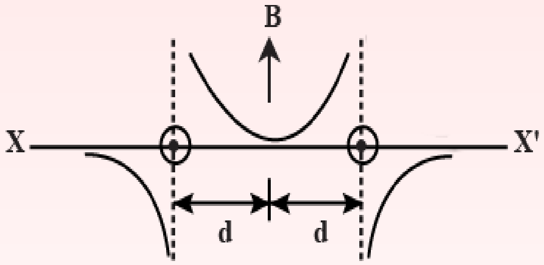

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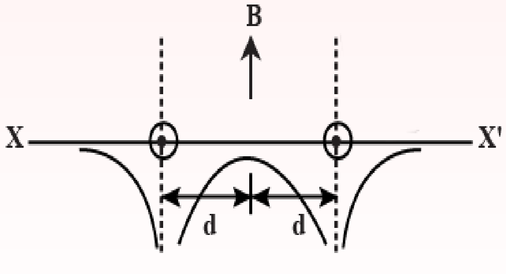

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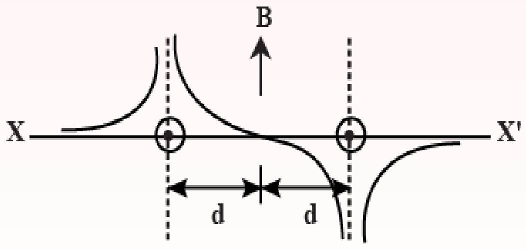
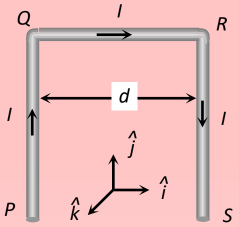


21. PQ and RS are long straight conductors, distance d apart, carrying a current I. The magnetic field at the midpoint of QR is



a) $\frac{-\mu_0 I}{2\pi d}\hat{k}$ b) $\frac{-\mu_0 I}{\pi d}\hat{k}$ c) $\frac{-\mu_0 I}{4\pi d}\hat{k}$ d) $\frac{-\mu_0 I}{8\pi d}\hat{k}$

22. A small bar magnet A oscillates in a horizontal plane with a period T at a place where the angle of dip is 60°. When the same needle is made to oscillate in a vertical plane coinciding with the magnetic meridian, its period will be

a) $\frac{T}{\sqrt{2}}$ b) T c) $\sqrt{2}T$ d) $2T$

23. A magnet oscillating in a horizontal plane has a time period of 2 *second* at a place where the angle of dip is 30° and 3 *seconds* at another place where the angle of dip is 60°. The ratio of resultant magnetic fields at the two places is

a) $\frac{4\sqrt{3}}{7}$ b) $\frac{4}{9\sqrt{3}}$ c) $\frac{9}{4\sqrt{3}}$ d) $\frac{9}{\sqrt{3}}$

24. A straight wire carrying current i is turned into a circular loop. If the magnitude of magnetic moment associated with it in M.K.S. unit is M, the length of wire will be

a) $4\pi iM$ b) $\sqrt{\frac{4\pi M}{i}}$ c) $\sqrt{\frac{4\pi i}{M}}$ d) $\frac{M\pi}{4i}$

25. The magnetising field required to be applied in opposite direction to reduce residual magnetism to zero is called

a) Coercivity b) Retentivity c) Hysteresis d) None of these

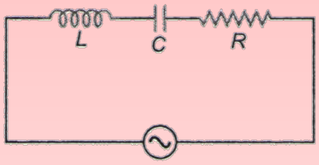
26. What happens to the force between magnetic poles when their pole strength and the distance between them are both doubled

a) Force increases to two times the previous value
b) No change
c) Force decreases to half the previous value
d) Force increases to four times the previous value

27. The self-inductance of a circular coil with 200 turns of wire and a radius of 5 cm is

a) 12.5×10^{-3}mH b) 25 mH c) 50×10^{-3}H d) 50×10^{-3}mH

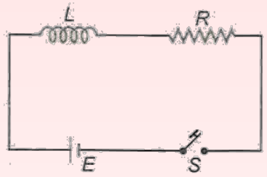
28. In the given circuit, a 150 V AC source with a frequency of 300 Hz is connected to an L-C-R circuit. The circuit consists of an inductor (L) with an inductance of 7.1 mH, a capacitor (C) with a capacitance of 12.5 μF, and a resistor (R) with a resistance of 20 Ω. These components are connected in series.
What is the quality factor?



a) 2.02 b) 6.5434 c) 0.668 d) 600

29. A complex current wave is given by I = (2+2 sin100 πt) A. Its average value over one time period is given as
a) 10 A b) 2A c) 5A d) 20 A

30. In the given circuit, when the switch S is closed at time t=0, determine the amount of charge that flows through the battery within one time constant.



a) $\frac{EL}{e\,R^2}$ b) $\frac{eL}{ER}$ c) $\frac{eR^2E}{L}$ d) $E\left(\frac{L}{R}\right)$

31. An inductive circuit contains a resistance of 20 ohm and an inductance of 4.0 henry. If an ac voltage of 60 volt and frequency of 30 Hz is applied to this circuit, the current in the circuit would be

a) 0.32 amp b) 1.87 amp c) 0.48 amp d) 0.80 amp

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32. An Electromagnetic Wave of frequency v = 3.0 MHz passes from vacuum into a dielectric medium with permittivity $\varepsilon = 4.0$. Them

a) Wavelength is doubled and the frequency remains unchanged
b) Wavelength is doubled and frequency becomes half
c) Wavelength is halved and frequency remains unchanged
d) Wavelength and frequency both become unchanged

33. The amplitude of electric field in a parallel beam of light of intensity 4 $\mathrm{Wm^{-2}}$ is

a) 40.5 $\mathrm{NC^{-1}}$ b) 45.5 $\mathrm{NC^{-1}}$ c) 50.5 $\mathrm{NC^{-1}}$ d) 55.5 $\mathrm{NC^{-1}}$

34. Assume that a lamp radiates power P uniformly in all directions. What is the magnitude of electric field strength at a distance r from the lamp?

$a)$ $\frac{P}{\pi c\varepsilon_0 r^2}$ b) $\frac{P}{2\pi c\varepsilon r^2}$ c) $\sqrt{\frac{P}{2\pi\varepsilon_0 r^2 c}}$ d) $\sqrt{\frac{P}{\pi\varepsilon_0 c r^2}}$

35. The wavelength of infrared rays is of the order of

$a)$ 5×10^{-7}m b) 10^{-3}m c) Diverge more d) None of these

36. Molybdenum is used as a target element for the production of X-rays because it is

a) Light and can easily defect electrons b) Light and can absorb electrons
c) A heavy element with a high melting d) An element having high thermal conductivity

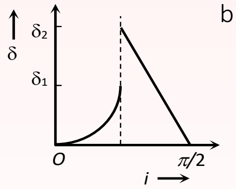
37. If a small object is positioned 20 cm in front of a plane mirror, and you stand behind the object, 30 cm from the mirror to observe its image, you would need to focus your eyes at a distance of

a) 20 cm b) 50 cm c) 80 cm d) 40 cm

38. A ray of light travels from a medium of refractive index μ to air. Its angle of incidence in the medium is i, measured from the normal to the boundary, and its angle of deviation is δ. δ is plotted against i which of the following best represents the resulting curve

1.

a)



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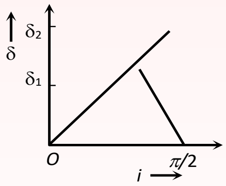

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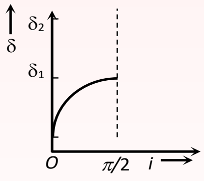

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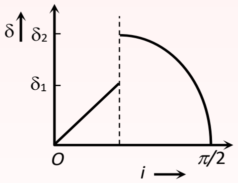

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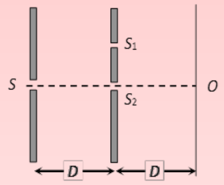
39. When a beam of plane-polarized light, with an incident flux of energy of 2×10^{-3} W, falls normally on a polarizer of cross-sectional area 2×10^{-4} m^2, the polarizer begins to rotate with an angular frequency of 31.4 rad/s. What will be the energy of the light passing through the polarizer per revolution?

a) 3×10^{-4}Joule b) 10^{-3}Joule c) 3×10^{-2}Joule d) 10^{-1}Joule

40. In the given setup, there are two ideal slits, S_1 and S_2, separated by a distance d. The slits are illuminated by light of wavelength λ, which passes through an ideal source slit, S, positioned on the same line as S_2. The planes of the slits and the source slit are separated by a distance D. A screen is placed at a distance D from the plane of the slits. What is the minimum value of d required for achieving darkness at point O?



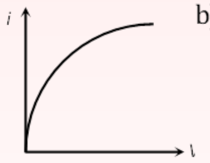
a) $\sqrt{\frac{3\lambda D}{2}}$ b) $\sqrt{\lambda D}$ c) $\sqrt{\frac{\lambda D}{2}}$ d) $\sqrt{3\lambda D}$

41. If a parallel beam of light, carrying 40 W of power, is incident normally on a plane surface that absorbs 30% of the light and reflects the remaining portion, what is the force exerted by the beam on the surface?

a) 1.73×10^{-8}N b) 1.73×10^{-7}N c) 5.12×10^{-7}N d) 5.12×10^{-8}N

42. What is the relationship between (i) and potential difference (V) for a photoelectric cell?

1.

a)


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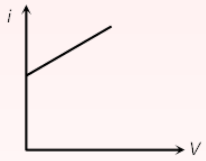

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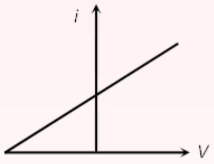

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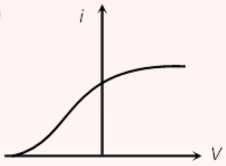


43. What is the relationship between the distance of closest approach for an alpha nucleus and the energy of the nucleus when it collides with a heavy nuclear target of charge Ze?

$a)\ v^2$ b) 1/m c) $1/v^4$ d) $1/Ze$

44. The mass defect in particular nuclear reaction is 0.4 g. The amount of energy liberated is (Velocity of light= $3 \times 10^8\ \mathrm{ms}^{-1}$)

$a)\ 1.5 \times 10^6$ b) 2.5×10^7 c) 3×10^6 d) 10^7

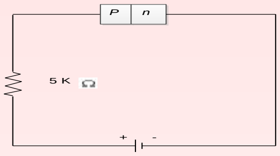
45. Given a zener diode with a contact potential of 2 V when unbiased, it experiences Zener breakdown when the electric field at the depletion region of its p-n junction reaches 10^5 V/m. If the width of the depletion region is 3 µm, what magnitude of reverse bias voltage should be applied to the zener diode to trigger the Zener breakdown?

a) 4 V b) 6 V c) 1 V d) 5 V

46. The current gain α of a transistor is 0.5. The transistor is connected to common base configuration. What would be the change in collector current when base current changes by 2.5 mA?

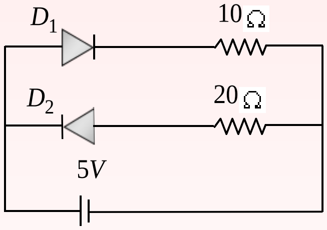
a) 1.2 mA b) 12 mA c) 24 mA d) 2.5 mA

47. A p-n junction in series with a resistance of 3 kΩ is connected across a 30 V DC source. If the forward bias resistance of the junction is 60 Ω, the forward bias current is



a) 9.8 mA b) 1 mA c) 2 mA d) 9.9 mA

48. In the given circuit, there are two ideal diodes connected to a battery. Determine the current provided by the battery.



a) 0.75 A b) Zero c) 0.25 A d) 0.5 A

49. In a triode valve the amplification factor is 10 and mutual conductance is 2×10^{-3} mho. The plate resistance is

a) $2 \times 10^3\ \Omega$ b) $5 \times 10^3\ \Omega$ c) $2 \times 10^4\ \Omega$ d) $2 \times 10^5\ \Omega$

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50. A radar has a power of 1 kW and is operating at a frequency of 10 GHz. It is located on a mountain top, of height 500 m. The maximum distance upto which it can detect object located on the surface of the earth is:
(Radius of earth $=6.4\times10^{6}$ m)
a) 80 km
b) 16 km
c) 40 km
d) 64 km

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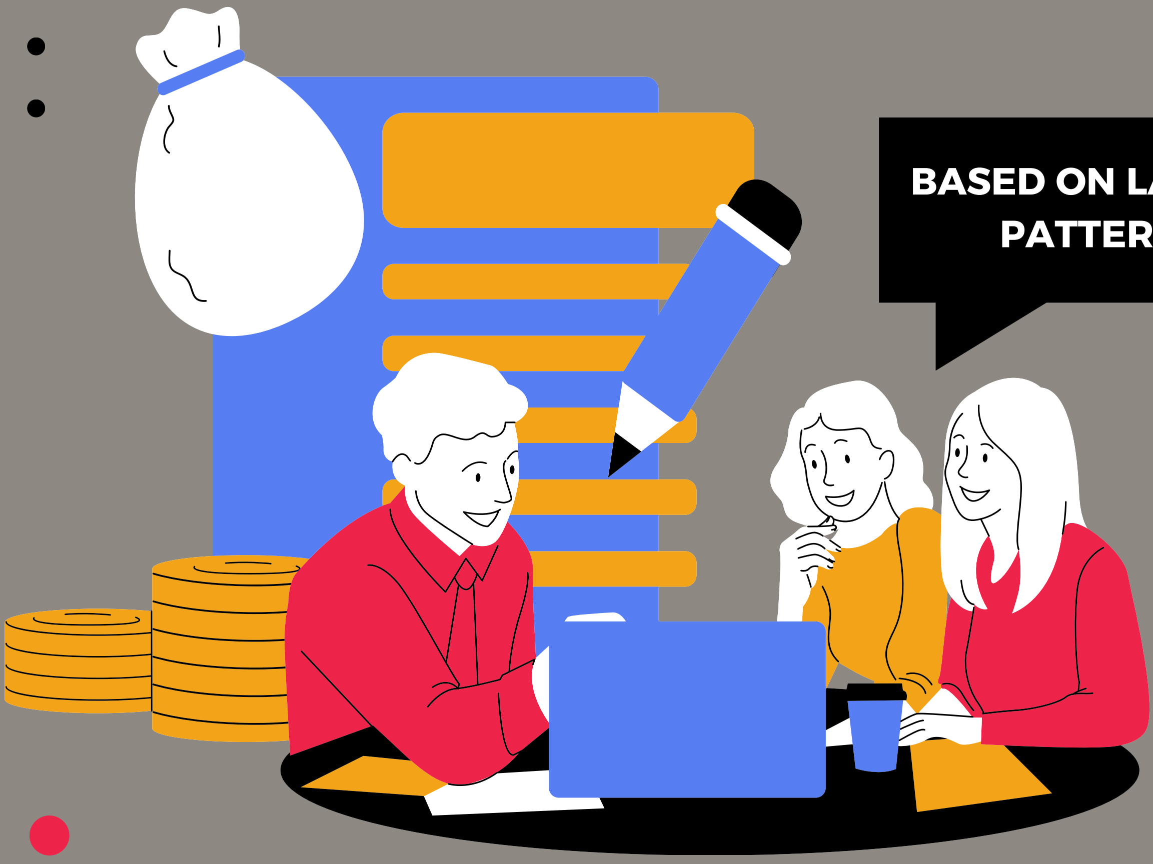
PHYSICS

Sample Paper 4



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CUET PRATICE PAPER- 4

PHYSICS

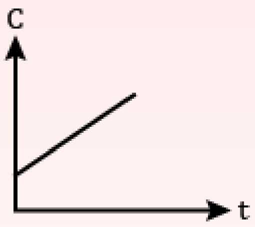
1. When the charge of a body becomes half, the electric field becomes
a) half b) twice c) thrice d) No change

2. A charged particle is free to move in an electric field. It will travel
a) always along a line of force
b) along a line of force, if its initial velocity is zero
c) along a line of force, if it has some initial velocity in the direction of an acute angle with the line of force
d) None of the above

3. Two field lines can never cross each other because
a) field lines are closed curves
b) field lines repel each other
c) field lines crowded only near the charge
d) field has a unique direction at each point

4. A parallel-plate capacitor has a dielectric slab in it. The slab just fills the space inside the capacitor. The capacitor is charged by a battery and then the battery is disconnected. Now, the slab is pulled out slowly at t=0. If at time t, the capacitance of the capacitor is C and potential difference between the plates of the capacitor is V, then which of the following graphs is/are correct.

a)



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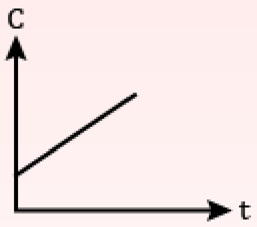
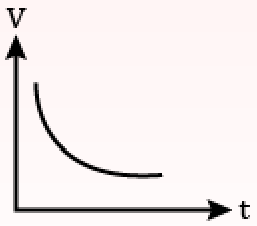
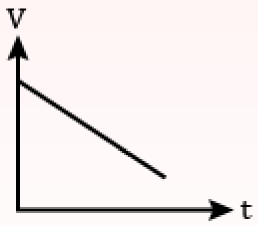


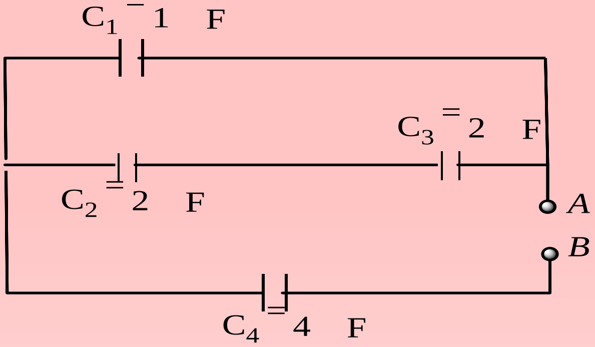
b)



d)



5. Four capacitors are connected in a circuit as shown in the following figure. Calculate the effective capacitance between the points A and B.

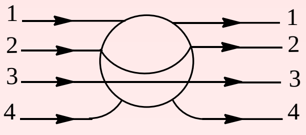


a) $\frac{4}{3}$ μF
b) $\frac{24}{5}$ μF
c) 9 μF
d) 5 μF

6. Two capacitors of capacitance C are connected in series. If one of them is filled with dielectric substance K, what is the effective capacitance?

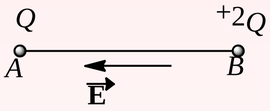
$a)$ $\frac{KC}{(1+K)}$
b) $C(K+1)$
c) $\frac{2KC}{(1+K)}$
d) None of these

7. A metallic solid sphere is placed in a uniform electric field. The lines of force follow the paths shown in figure



a) 1
b) 2
c) 3
d) 4

8. Charges $+2Q$ and $-Q$ are placed as shown is figure. The point at which electric filed intensity is zero will be



a) Somewhere between $-Q$ and $+2Q$
b) Somewhere on the left of $-Q$
c) Somewhere on the right of $+2Q$
d) Somewhere on the right bisector of line joining $-Q$ and $+2Q$.

9. The electric potential inside a conducting sphere

a) Increases from centre to surface
b) Decreases from centre to surface
c) Remains constant from centre to surface
d) Is zero at every point inside

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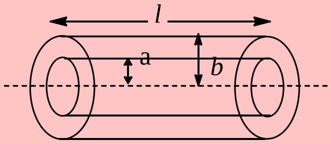
10. The magnitude of electric field $\vec{E}$ in the annual region of a charged cylindrical capacitor



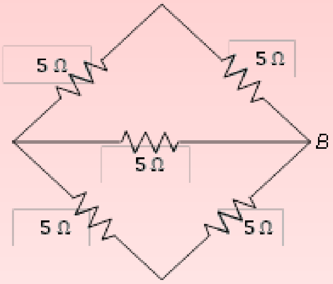
a) Is same throughout

b) Is higher near the outer cylinder than near the inner cylinder

c) Varies as $\frac{1}{r},$ where r is the distance from the axis

d) Varies as $\frac{1}{r^2},$ where r is the distance from the axis

11. Each resistance shown in figure is 5 Ω. The equivalent resistance between A and B is



a) 5 Ω b)4 Ω c)10 Ω d)1Ω

12. We have two resistances, R1 and R2, which are composed of different materials. The material of R1 has a temperature coefficient of α, while the material of R2 has a temperature coefficient of -β. To ensure that the resistance of the series combination of R1 and R2 remains constant regardless of temperature, the ratio R1/R2 is

a) $\frac{\alpha}{\beta}$ b) $\frac{\alpha+\beta}{\alpha-\beta}$ c) $\frac{\alpha^2+\beta^2}{\alpha\beta}$ d) $\frac{\beta}{\alpha}$

13. The thermo-electromotive force (EMF) in a thermocouple is expressed by the equation $E = 5\theta - \frac{\theta^2}{20}$, where θ represents the temperature difference between the two junctions. To determine the neutral temperature in this context, what is the value of θ at which the EMF is zero.

a) 100℃ b) 200℃ c) 50℃ d) 10℃

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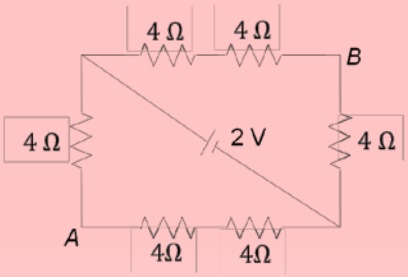
14. The potential difference between the points A and B will be



$a) \frac{2}{3}$V b)$\frac{8}{9}$V c)$\frac{4}{3}$V d)2V

15. In a thermoelectric couple, one junction is maintained at a constant temperature Tr, while the temperature of the other junction is denoted as T. The thermo-electromotive force for this couple is expressed as $E = K(T - T_r)[\, T_0 + \frac{1}{2}(T^2 + T_r^2)\,]$
What is the value of the thermoelectric power, when T is equal to 2T1.

$a)\ \frac{1}{2}\ K\,T_0$ b)$\frac{3}{2}\ K\,T_0$ c)$\frac{1}{2}\ K\,T_0^2$ d)$\frac{1}{2}K\,(T_0 - T_r)^2$

16. Two cells connected in parallel, with internal resistances of 0.6 Ω and 0.4 Ω. The voltage across the combination of cells is measured to be 1.5 V. If the electromotive force (emf) of one cell is 1.2 V, determine the emf of the second cell

a)2.7 V b) 2.1 V c) 3 V d) 4.2V

17. If a straight wire carrying a current i is transformed into a circular loop, and the magnitude of the magnetic moment associated with the loop is represented by M in MKS units, determine the length of the wire used in creating the loop.

a) $\frac{4\pi}{M}$ b) $\sqrt{\frac{4\,\pi\,M}{i}}$ c) $\sqrt{\frac{r\,\pi\,i}{M}}$ d) $\frac{M\,\pi}{4\,i}$

18. When two parallel wires in free space are situated 15 cm apart and each wire carries a current of 5 A in the same direction, calculate the force per meter of length that one wire exerts on the other.

a) 2×10^{-4}N, attractive b) 3.33×10^{-4}N, repulsive
b) 3.33×10^{-5}N, attractive d) 2×10^{-7}N, repulsive

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19. Consider two long solenoids. The first solenoid consists of 100 turns per cm and carries a current of magnitude i, resulting in a magnetic field of 8.3×10^{-2} Wb/m^2 at its centre. The second solenoid is comprised of 200 turns per cm and carries a current of magnitude i/3. Find the value of the magnetic field at the centre of the second solenoid.
    - *a)* $5.5\times10^{-2}\ \mathrm{Wbm^{-2}}$
    - *b)* $5.5\times10^{-5}\ \mathrm{Wbm^{-2}}$
    - *c)* $5.5\times10^{-3}\ \mathrm{Wbm^{-2}}$
    - *d)* $5.5\times10^{-4}\ \mathrm{Wbm^{-2}}$

20. In the given situation, there exists a homogeneous electric field $\vec{E}$ and a uniform magnetic field $\vec{B}$, both pointing in the same direction. A proton is projected with a velocity parallel to $\vec{E}$. Determine the behaviour or the path followed by the proton under these conditions.
    - a) Go on moving in the same direction with increasing velocity
    - b) Go on moving in the same direction with constant velocity
    - c) Turn to its right
    - d) Turn to its left

21. A large magnet is broken into two pieces so that their lengths are in the 4:1. The pole strengths of the two pieces will have ratio

    a) 2 : 1 b) 1 : 2 c) 4 : 1 d) 1 : 1

22. Two short magnets having magnetic moments in the ratio $27 : 8$, when placed on opposite sides deflection magnetometer, produce no deflection. If the distance of the weaker magnet is $0.12\ m$ centre of deflection magnetometer, the distance of the stronger magnet from the centre is

    a)$0.06\ m$ b) $0.08\ m$ c) $0.12\ m$ d) $0.18\ m$

23. A magnet 20 cm long with its poles concentrated at its ends is placed vertically with its north pole on the table. At a point due 20 cm south (magnetic) of the pole, a neutral point is obtained. If H =0.3 G, then the pole strength of the magnet is approximately

    a)185 ab-amp-cm b) 185 amp-m c) 18.5 ab-amp-cm d) 18.5 amp-cm

24. A magnetic needle lying parallel to a magnetic field requires W units of work to turn it through 60°. The torque required to keep the needle in this position will be

    a) $2W$ b) W c) $\frac{W}{\sqrt{2}}$ d) $\sqrt{3}W$

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25. Which of the following statements is incorrect about hysteresis

a) This effect is common to all ferromagnetic substances

b) The hysteresis loop area is proportional to the thermal energy developed per unit volume of the material

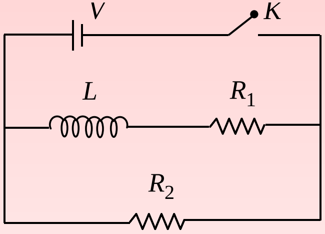
c) The hysteresis loop area is independent of the thermal energy developed per unit volume of the material

d) The shape of the hysteresis loop is characteristic of the material

26. The area of hysteresis loop of a material is equivalent to 250 $joule$. When 10 kg material is magnetized by an alternating field of 50 Hz then energy lost in one hour will be (density of material is 7.5 gm/cm^3)

$a)$ $6 \times 10^4 J$ b) $6 \times 10^4 erg$ c) $3 \times 10^2 J$ d) $3 \times 10^2 erg$

27. When the key K in the circuit shown below is closed at t=0, the resulting current through the battery is



a) $\frac{V(R_1+R_2)}{R_1R_2}$ at $t = 0$ and $\frac{V}{R_2}$ at $t = \infty$

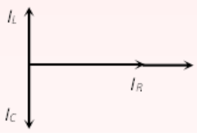
b) $\frac{V(R_1+R_2)}{\sqrt{R_1^2R_2^2}}$ at $t = 0$ and $\frac{V}{R_2}$ at $t = \infty$

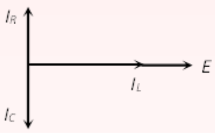
c) $\frac{V}{R_2}$ at $t = 0$ and $\frac{V(R_1+R_2)}{R_1R_2}$ at $t = \infty$

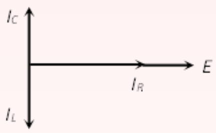
d) $\frac{V}{R_2}$ at $t = 0$ and $\frac{V(R_1+R_2)}{\sqrt{R_1^2R_2^2}}$ at $t = \infty$

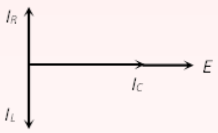
28. Given an alternating electromotive force (emf) applied across a parallel combination of a resistance R, capacitance C, and an inductance L, determine the correct diagram representing the phase relationship between the currents I_R, I_L, I_C, and the source emf E.

1.

a)


b)


c)


d)


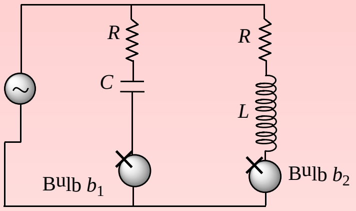
29. A transformer is having 700 turns in primary and 2800 turns in secondary. An AC source of 140 V, 20 A is connected to its primary. The secondary voltage and current are

a) 240 V,5 A b) 120 V, 10 A c) 240 V, 10 A d) 240 5 A

30. In an AC circuit where an AC potential of E = E_0 sin (ωt) is applied, and a current I given by I_0 sin (ωt - π/2) flows, determine the power consumption P in the circuit.

a) $P = \frac{E_0 I_0}{\sqrt{2}}$ b) $P = \sqrt{2} E_0 I_0$ c) $P = \frac{E_0 I_0}{2}$ d) $P = 0$

31. When two identical incandescent light bulbs are connected in a circuit and an AC voltage source of frequency f is applied, which of the following observations will be correct?



a) Both bulbs will glow alternatively
b) Both bulbs will glow with same brightness provided $f = \frac{1}{2\pi}\sqrt{(1/LC)}$
c) Bulb b_1 will light up initially and goes off, bulb b_2 will be ON constantly
d) Bulb b_1 will blink and bulb b_2 will be ON constantly

32. A charged particle with charge *q* enters a region of constant, uniform and mutually orthogonal fields **E** and **B** with a velocity **v** perpendicular to both **E** and **B**, and comes out without any change in magnitude or direction of **v.** Then

a) $\mathbf{v} = \mathbf{E} \times \frac{\mathbf{B}}{B^2}$
b) $\mathbf{v} = \mathbf{B} \times \frac{\mathbf{E}}{B^2}$
c) $\mathbf{v} = \mathbf{E} \times \frac{\mathbf{B}}{E^2}$
d) $\mathbf{v} = \mathbf{B} \times \frac{\mathbf{E}}{E^2}$

33. If v_s, v_x and v_m are the speeds of gamma rays, X-rays and microwaves respectively in vacuum, t

a) $v_s > v_x > v_m$ b) $v_s < v_x < v_m$ c) $v_s < v_x < v_m$ d) $v_s = v_x = v_m$

34. The small ozone layer on top of the atmosphere is crucial for human survival because it

a) Has ions b) Reflects radio signals c) Absorbs UV rays d) Reflects IR rays

35. Television signals reach us only through the ground waves. The range R related with the transmi height h is in proportion to

$a)\ h$ b) $h^{1/2}$ c) $h^{-1/2}$ d) h^{-1}

36. In a plane electromagnetic wave propagating in space has an electric field of amplitude 9×10^3 then the amplitude of the magnetic field is

a) 2.7×10^{12} T b) 9.0×10^{-3} T c) 3.0×10^{-4} T d) 3.0×10^{-5} T

37. If a 150 W unidirectional bulb has a luminous intensity of 80 candela, the total luminous flux emitted by the bulb is

a) 861 $lumen$ b) 1005 $lumen$ c) 1256 $lumen$ d) 1561 $lumen$

38. The dispersive powers of crown and flint glasses are 0.01 and 0.03 respectively. In an achromatic combination of lenses, the focal length of flint glass lens is 20 cm. The focal length of crown glass lens will be

$a) - 6.67\ cm$ b) $+6.67\ cm$ c) $-10.3\ cm$ d) $+10.3\ cm$

39. A sugar solution has a specific rotation of 0.7 deg m^2 k/g. A sample of impure sugar solution with a density of 200 kg m^{-3} is taken in a polarimeter tube with a length of 20 cm. The observed optical rotation in the polarimeter is found to be 19°. What is the percentage of purity of the sugar in the solution?

a) 20% b) 80% c) 95% d) 97%

40. The angle of polarization for any medium is 30°, what will be critical angle for this

a) $\sin^{-1}\sqrt{3}$ b) $\tan^{-1}\sqrt{3}$ c) $\cos^{-1}\sqrt{3}$ d) $\sin^{-1}\frac{1}{\sqrt{3}}$

41. The work function for metals A, B and C are respectively 1.94 eV, 2.0 eV and 4 eV. According to the Einstein's equation, the metals which will emit photo electrons for a radiation of wavelength 4000 Å is/are

a) None of these b) A only c) A and B only d) All the three metals

42. In the experimental setup of photoelectric effect, the metal surface is first illuminated with violet light and then with ultraviolet light and the stopping potential is determined in each case. The stopping potential will

a) Be more with violet light
b) Be more with ultraviolet light
c) Be equal in both cases
d) Depend upon the current

43. The ratio of minimum to maximum wavelength in Paschen series is

a) 7:16 b) 5:36 c) 1:144 d) 3:4

44. The electron in the hydrogen atom jumps from excited state $(n = 2)$ to its ground state $(n = 1)$ and the photons thus emitted irradiate a photosensitive material. If the work function of the material is 6.2 eV, the stopping potential is estimated to be (the energy of the electron in n^{th} state $E_n = -\frac{13.6}{n^2} eV$)

a) 5.1 V b) 12.1 V c) 17.2 V d) 16.4 V

45. Why does the resistance of a metal and a semiconductor vary differently with temperature?

a) Crystal structure
b) Variation of the number of charges carries with temperature
c) Type of bonding
d) Variation of scattering mechanism with temperature

46. The resonance frequency of the tank circuit of an oscillator when $L = \frac{20}{\pi^2}$ mH and $C = 0.5\mu$ F are connected in parallel is

a) 5 kHz b) 50 kHz c) 0.5 kHz d) 5 MHz

47. The device that can act as a complete electronic circuit is

a) Zener diode b) Junction diode c) Integrated circuit d) Junction transistor

48. What is the difference in energy between the Fermi level and the conduction band in a silicon crystal with a forbidden gap width of 2.2 eV when it is converted into an N-type semiconductor?

a) Greater than 1.1 eV b) Equal to 1.1 eV c) Lesser than 1.1 eV d) Equal to 1.1 eV

49. An amplifier has a voltage gain $A_V = 100$. The voltage gain in dB is

a) 10 dB b) 40 dB c) 3 dB d) 20 B

50. Approximately how many photons are emitted per second by a 10 kW transmitter emitting radio waves with a wavelength of 500 m?

a) 10^{37} b) 10^{31} c) 10^{25} d) 10^{43}

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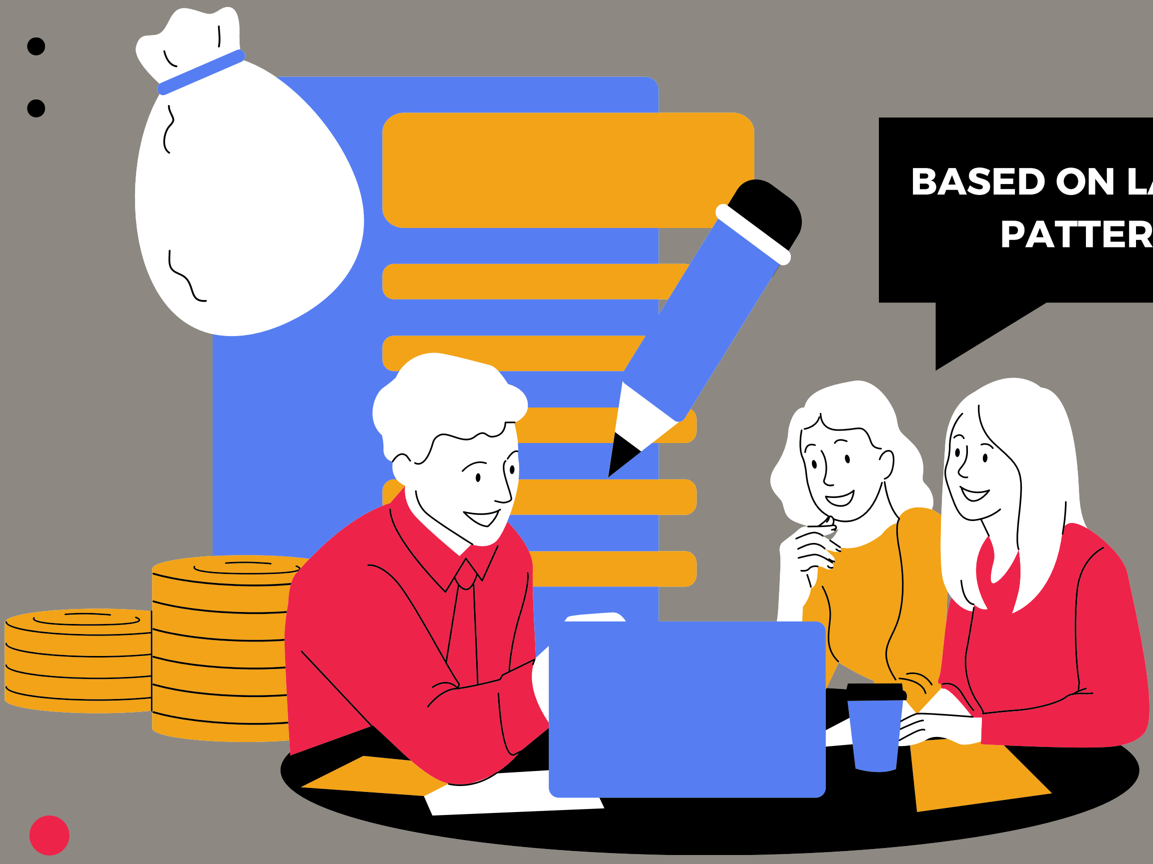
PHYSICS

Sample Paper 5



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CUET PRATICE PAPER- 5

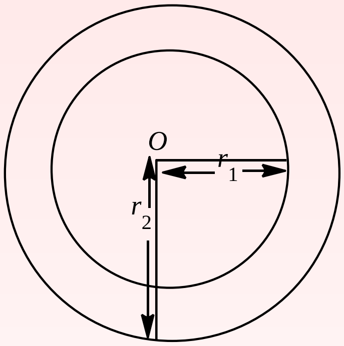
PHYSICS

1. The surface charge density s of an area element ignores
a) the quantisation of charge
b) discontinuity in charge distribution at macroscopic level
c) discontinuity in charge distribution at microscopic level
d) Both (a) and (c)

2. A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of 80 $\mu C m^{-2}$. What is the charge on the sphere?
a) 0.7×10^{-1} C b) 1.4×10^{-4} C c) 1.4×10^{-3} C d) 1.7×10^{-4} C

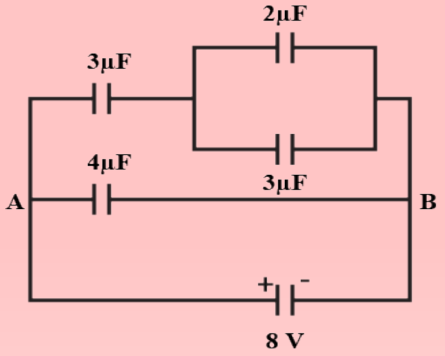
3. If ∫E. dS = 0 over a surface, then
a) the electric field inside the surface and on it is zero
b) the electric field inside the surface is necessarily uniform
c) the number of flux lines entering the surface must be equal to the number of flux lines leaving it
d) None of the above

4. In the given figure, a hollow spherical capacitor is shown. The electric field will not be zero at



a) 45 V b)60 V c)35 V d)90V

5. The charge on the condenser of capacitance 2μF in the following circuit will be



a) 4.5 μC b) 6.0 μC c) 7 μC d) 30 μC

6. The minimum number of condensers each of capacitance of 2 μF, in order to obtain resultant capacitance of 5 μF will be

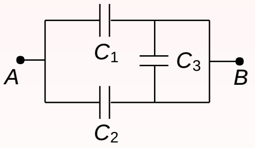
a) 4 b) 5 c) 6 d) 10

7. Identify the wrong statement.
   a) The electrical potential energy of a system of two protons shall increase if the separation between the two is decreased.
   b) The electrical potential energy of a proton-electron system will increase if the separation between the two is decreased.
   c) The electrical potential energy of a proton-electron system will increase if the separation between the two is increased.
   d) The electrical potential energy of system of two electrons shall increase if the separation between the two is decreased.

8. When two conductors of charges and potentials C_1, V_1 and C_2, V_2 respectively are joined, the common potential will be.

a) $\frac{C_1V_1 + C_2V_2}{V_1 + V_2}$ b) $\frac{C_1V_1^2 + C_2V_2^2}{V_1^2 + V_2^2}$ c) $C_1 + C_2$ d) $\frac{C_1V_1 + C_2V_2}{C_1 + C_2}$

9. The equivalent capacitance of the combination of three capacitors, each of capacitance *C* shown in figure between points *A* and *B* is



a) 3C/2 b) C/2 c) 1/3C d)2C

10. Electric potential at the centre of a charged hollow metal sphere is.

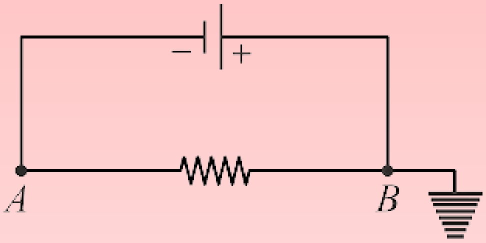
a) Zero

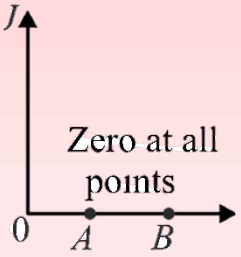
b) Twice as that on the surface

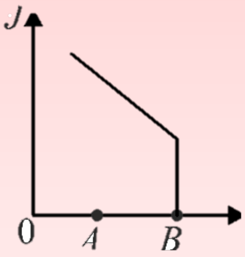
c) Half of that on the surface

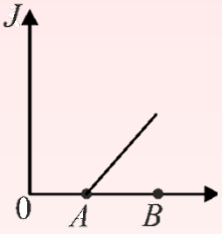
d) Same as that on the surface

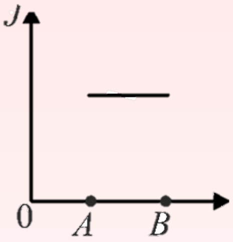
11. A uniform resistance wire AB is connected to a battery, and point B is earthed. We are given a set of graphs, determine which one depicts the variation of current density J along AB.



a)


c)


b)


d)


12. In an ionization chamber with parallel conducting plates serving as the anode and cathode, there are 2×10^7 electrons and an equal number of singly charged positive ions cm^3. The electrons are moving towards the anode at a velocity of 0.4 m/s. The current density from the anode to the cathode is $7\mu A/m^2$. Determine the velocity of the positive ions moving towards the cathode

a) 0.4 m/s

b) 0.9 m/s

c)0.8 m/s

d) 1 m/s

13. Two resistors are connected (a) in series (b) in parallel. The equivalent resistance in the two cases is 10 ohm and 8 ohm respectively. Then the resistance of the component resistors is

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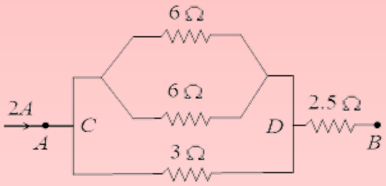
a) 2 ohm and 7 ohm

b) 8 ohm and 10 ohm

c) 3 ohm and 9 ohm

d) 5 ohm and 4 ohm

14. What is the equivalent resistance and potential difference across the points A and B respectively?



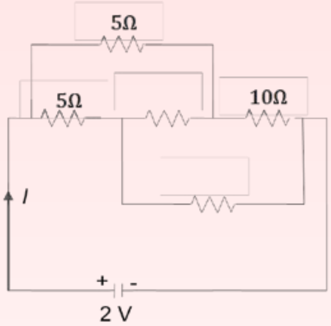
a) 4 Ω, 8 V

b) 8 Ω, 4 V

c) 2 Ω, 2 V

d) 16 Ω, 18V

15. The current *I* drawn from the 2 V source will be



a) 0.83A

b) 0.5A

c) 0.67A

d) 0.17A

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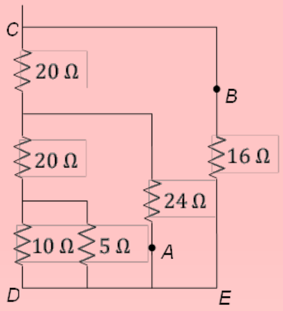
16. What is the equivalent resistance across the points A and B in the circuit given below?



a) 8 Ω b) 12 Ω c) 16 Ω d) 32 Ω

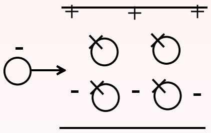
17. At a specific location, the magnetic induction of the Earth is measured to be 6×10^{-6} Wb/m^2. To counteract this magnetic induction, we need to generate an equal and opposite magnetic induction at the centre of a circular conducting loop with a radius of 5 cm. Find the current value required in the loop.

a) 0.56 A b) 5.6 A c) 0.28 A d) 2.8 A

18. A horizontal rod, weighing 15 gm and measuring 20 cm in length, is placed on a smooth inclined plane tilted at a 60° angle with respect to the horizontal. The rod is oriented parallel to the edge of the inclined plane. To maintain the rod in a stationary position on the inclined plane, a uniform magnetic field of induction B is applied vertically downward. The current passing through the rod is set to 1.96 amperes. Find the specific value of B that allows the rod to remain motionless on the inclined plane.

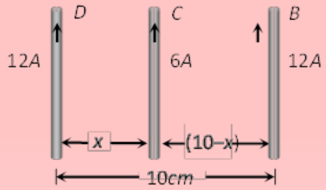
a) 1.96 tesla b) $\frac{1}{1.96}$ tesla c) 0.66 tesla d) None of the above

19. Consider where an electron enters the region between the plates of a charged capacitor, as depicted. The plates have a charge density of σ, generating an electric field intensity E in the space between them. Additionally, a uniform magnetic field B exists in the same region, perpendicular to both the direction of the electric field E and the electron's motion. The electron moves perpendicular to both E and B, maintaining its path without any deviation. Determine the time required for the electron to cover a distance of l in this region.



a) $\frac{\sigma l}{\varepsilon_0 B}$ b) $\frac{\sigma B}{\varepsilon_0 l}$ c) $\frac{\varepsilon_0 lB}{\sigma}$ d) $\frac{\varepsilon_0 l}{\sigma B}$

20. Consider a configuration where three long, straight, and parallel wires carrying currents are arranged as shown in the figure. Wire C, carrying a current of 6.0 A, is positioned in such a way that it experiences no force. Find the distance between wire C and wire D in this arrangement.



a) 9 cm b) 7 cm c) 5 cm d) 3 cm

21. A wire along x-axis carries a current 5 A. Find the force in newton on a 2 cm section of the wire exerted by a magnetic field $\vec{B} = (0.85\,\hat{j} + 0.24\,\hat{k})$ T.

a) $\left(1.26\,\hat{k} - 2.59\,\hat{j}\right)10^{-2}$ N b) $\left(-1.26\,\hat{k} + 2.59\,\hat{j}\right) \times 10^{-2}$ N

c) $\left(-2.97\,\hat{k} + 0.84\,\hat{j}\right) \times 10^{-2}$ N d) $2.97\ \left(\hat{k} - 0.84\,\hat{j}\right) \times 10^{-2}$ N

22. The effective length of a magnet is 31.4 cm and its pole strength is 0.5 Am. Calculate its magnetic moment. If it is bent in form of semicircle, then magnetic moment will be

a) $0.157\ \mathrm{Am}^2, 0.01\ \mathrm{Am}^2$ b) $0.357\ \mathrm{Am}^2, 0.01\ \mathrm{Am}^2$

c) $1.157\ \mathrm{Am}^2, 1.01\ \mathrm{Am}^2$ d) None of these

23. A short bar magnet of magnetic moment 255 JT^{-1} is placed with its axis perpendicular to earth's field direction. At what distance from the center of the magnet, the resultant field is inclined at 45° with earth's field, $H = 0.4 \times 10^{-4}$ T ?

a) 5 m b) 0.5m c) 2.5 m d) 0.25 m

24. When a piece of a ferromagnetic substance is put in a uniform magnetic field, the flux density inside it is four times the flux density away from the piece. The magnetic permeability of the material (in $\mathrm{N/A^2}$) is

a) 1 b) 2 c) 3 d) 4

25. Each atom of an iron bar ($5cm \times 1cm \times 1cm$) has a magnetic moment $1.8 \times 10^{-23} Am^2$. Knowing that the density of iron is $7.78 \times 10^3\ kg\ m^{-3}$, atomic weight is 56 and Avogadro's number of 6.02×10^{23} the magnetic moment of bar in the state of magnetic saturation will be

a) $4.75\ Am^2$ b) $5.74\ Am^2$ c) $7.54\ Am^2$ d) $75.4\ Am^2$

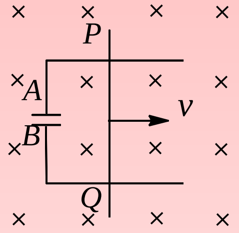
26. Susceptibility of ferromagnetic substance is

a) >1 b) <1 c) Zero d) 1

27. When a square loop with a side length of 20 cm is transformed into a circular loop within a time of 0.5 seconds, and there is a uniform magnetic field of 0.2 T directed perpendicular to the loop, calculate the induced electromotive force (emf) in the loop

a) 17.2×10^{-3} V b) 6.6×10^{-5} V c) 17.2×10^{-4} V d) 4.60×10^{-8} V

28. A conducting rod PQ with a length of L = 4.0 m is moving at a uniform speed v = 2.0 m/s in a uniform magnetic field B = 8.0 T directed into the paper. A capacitor with a capacitance of C = 20 μF is connected in this setup. Then,



a) $q_A = -80\mu\, C \text{ and } q_B = +80\mu\, C$

b) $q_A = +80\mu\, C \text{ and } q_B = -80\mu\, C$

c) $q_A = 0 = q_B$

d) Charge stored in the capacitor increases exponentially with time

29. At time t = 0, a battery of 15 V is connected across points A and B in the given circuit. If the capacitors have no charge initially, at what time (in second) does the voltage across them become 2 V?

a) 0.6 b) 3 c) 2.5 d) $\frac{3}{2}$

30. In an AC circuit, a resistance of R Ω is connected in series with an inductance L. Given that the phase difference between the current and voltage is 45°, calculate the inductive reactance.

a) R/2 b) R/4 c) R d) None of the above

31. A capacitor is a perfect insulator for:

a) Alternating currents
b) Direct currents
c) Both ac and dc
d) None of these

32. A capacitor having a capacity of 2 pF. Electric field across the capacitor is changing with a value 10^{12} Vs^{-1}. The displacement current is

a) 2 A b) 4 A c) 6 A d) 10 A

33. If 150 J of energy is incident on area 2 m^2. If $Q_r = 15$ J, coefficient of absorption is 0.6, then an energy transmitted is

a) 50 J b) 45 J c) 40 J d) 30 J

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34. Radiations of intensity 0.5 Wm^{-2} are striking a metal plate. The pressure on the plate is
   - a) $0.166 \times 10^{-8}\ \mathrm{Nm}^{-2}$
   - b) $0.332 \times 10^{-8}\ \mathrm{Nm}^{-2}$
   - c) $0.111 \times 10^{-8}\ \mathrm{Nm}^{-2}$
   - d) $0.083 \times 10^{-8}\ \mathrm{Nm}^{-2}$

35. A charged particles oscillates about its mean equilibrium position with a frequency of 10^9 Hz. Fr of the Electromagnetic Waves produced by the oscillator is

   a) 10 Hz b) 10^5 Hz c) 10^9 Hz d) 10^{10} Hz

36. The unit of expression $\mu_0\varepsilon_0$ are

   a) ms^{-1} b) $\mathrm{m}^2\mathrm{s}^{-2}$ c) $\mathrm{s}^2\mathrm{m}^{-2}$ d) sm^{-1}

37. A boy is trying to start a fire by focusing Sunlight on a piece of paper using an equiconvex lens of focal length 20 cm. The diameter of the Sun is $1.39 \times 10^9\ m$ and its means distance from the earth is $1.5 \times 10^{11} m$. What is the diameter of the Sun's image on the paper

   a) $6.5 \times 10^{-5} m$ b) $12.4 \times 10^{-4} m$ c) $18.52 \times 10^{-4} m$ d) $6.5 \times 10^{-4} m$

38. The magnification produced by the objective lens and the eye lens of a compound microscope are 20 and 5 respectively. The magnification of this microscope is

   a) 25 b) 50 c) 100 d) 200

39. The two coherent sources of equal intensity produce maximum intensity of 50 units at a point. If the intensity of one of the sources is reduced by 53% by reducing its width then the intensity of light at the same point will be

   a) 30 b) 35.5 c) 67 d) 60.5

40. The velocity of a moving galaxy is 200 $km\ s^{-1}$ and the apparent change in wavelength of a spectral line emitted from the galaxy is observed as 0.2 nm. Then, the actual wavelength of the spectral line is

   a) 3000 Å b) 5000 Å c) 6000 Å d) 4500Å

41. What is the mathematical equation of Bragg's law?

   a) $2d \sin\theta = n\lambda$ b) $d \sin\theta = 2n\lambda$ c) $n \sin\theta = 2\lambda d$ d) None of these

42. The kinetic energy of an electron is 10 eV. Calculate the de-Broglie wavelength associated with it ($h = 6.6 \times 10^{-34}\mathrm{Js}, m_e = 9.1 \times 10^{-31}\mathrm{kg}$)

   a) 3.86 Å b) 10.9 Å c) 2.7 Å d) None of these

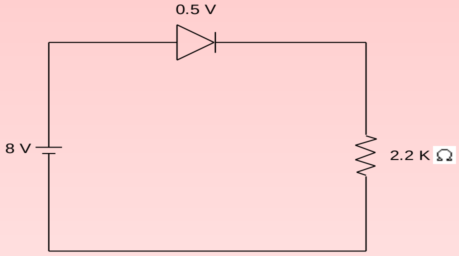
43. What is the excitation energy of a hydrogen atom when its electron transitions from the ground state (-13.6 eV) to the first excited state?

a) 3.4 eV b) 6.8 eV c) 10.2 eV d) zero

44. A mercury atom in its first excited state is brought to its ground state by a collision with an electron that passes through a potential difference of 3.5 V. Determine the wavelength of the photon emitted during the transition of the mercury atom to its ground state.

a) 2050 Å b) 2240 Å c) 3535 Å d) *2935* Å

45. In the circuit, if the forward voltage drop for the diode is 0.2 V, the current will be



a) 3.25 mA b) 2 mA c) 2.5 mA d) 5 mA

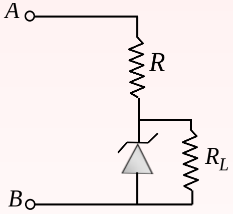
46. For a silicon diode with a 2µm wide depletion layer and a knee potential of 0.8 V, what is the magnitude of the electric field present within the depletion layer?

a) $0.4\ \mathrm{Vm}^{-1}$ b) $4 \times 10^4\ \mathrm{Vm}^{-1}$ c) $4 \times 10^5\ \mathrm{Vm}^{-1}$ d) Zero

47. In a body-centered packing of sodium atoms, where the distance between two nearest atoms is measured to be 7.4 Å, what is the lattice parameter of the sodium crystal structure?

a) 4.8 Å b) 4.3 Å c) 3.9 Å d) 3.3 Å

48. If the voltage between the terminals A and B is 10 V and Zener-breakdown voltage is 4 V, then the potential across R is



a) 6 V b) 8 V c) 9 V d) 17 V

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49. The value of current in a triode valve is given by $I_p = 0.002(V_p + 10V_g)^{3/2}$ mA . When plate potential and grid potential are 100 V and -2V respectively, then the value of mutual conductance will be

a) 600 mho b) 90 mho c) 6 mho d) 9×10^{-5} mho

50. A radio transmitter transmits at 830kHz. At a certain distance from the transmitter magnetic field has amplitude 4.82×10^{-11} T. Find the electric field and wavelength.
a) 0.014 N/C,36 m
b) 0.14 N/C,36 m
c) 0.14 N/C,360 m
d) 0.014 N/C,360 m

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